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THE CITY OF NEW YORK,

DEPARTMENT OF BRIDGES.

1905.

FORM OF

Proposals for Bids or Estimates, The Bid or Estimate, Bond, Contract and Specifications

FOR

Furnishing the Metalwork for the Anchorages

and

Constructing the Towers, Cables, Suspenders

and Suspended Superstructure

of the

MANHATTAN BRIDGE

Over the East River, Between the Boroughs of
Manhattan and Brooklyn.

Martin B. Brown Co., Printers, 49 to 57 Park Place, N. Y.

THE CITY OF NEW YORK,

DEPARTMENT OF BRIDGES.

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Manhattan and Brooklyn.

103.06 Print

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THE CITY OF NEW YORK,

DEPARTMENT OF BRIDGES.

AUTHORIZATION OF WORK.

November 30, 1898.

RESOLVED, That the Commissioner of Bridges, in conjunction with the President of the Board of Public Improvements, be and is hereby authorized and directed to prepare plans, surveys, soundings, etc., for the construction of a bridge over the East River, between the Borough of Manhattan and the Borough of Brooklyn, to be located at some point south of the "New East River Bridge."

I HEREBY CERTIFY that the foregoing is a true copy of a resolution adopted by the Board of Public Improvements at a regular meeting of said Board, held on the 30th day of November, 1898.

Dated November 30, 1898.

JOHN H. MOONEY,
Secretary Board of Public Improvements.

December 6, 1899.

RESOLVED, That it is desirable in the public interest that a bridge over the East River, between the Boroughs of Manhattan and Brooklyn, be constructed, and that work thereon be commenced and vigorously prosecuted to completion, and that the following be adopted and transmitted to the Municipal Assembly as the report of this Board, as required by Section 414 of the Greater New York Charter.

P 15015

To the Honorable the Municipal Assembly:

Pursuant to the requirements of Section 414 of The Greater New York Charter, the Board of Public Improvements of The City of New York does hereby report that at a meeting of said Board held on the 29th day of November, 1899, the following resolution was duly adopted, viz.:

"RESOLVED, Pursuant to the provisions of The Greater New York Charter, that the building of a bridge over the East River, between the Boroughs of Manhattan and Brooklyn, be and the same hereby is authorized and approved, and that the plans therefor prepared by the Commissioner of Bridges, in conjunction with the President of the Board of Public Improvements, as provided by resolution of this Board, adopted November 23d, 1898, be and the same hereby are approved."

Said Board further reports that the approximate cost of said bridge and the estimated cost of the land necessary for the abutments and approaches are as follows:

River spans, steel superstructure complete....	$3,412,000
Masonry piers and foundations..............	2,320,000
Approaches	2,950,000
Engineering and contingencies..............	870,000
Total	$9,552,000

The value of the land necessary for the abutments and approaches is as follows:

Brought forward		$9,552,000
Manhattan	$4,000,000	
Brooklyn	2,281,600	
		6,281,600
Total estimated cost of completed structure and approaches		$15,833,600

The selected route for the proposed bridge shows an elevation of a proposed structure, showing a maximum grade of 2 8-10 per cent., that of the present bridge being 3 25-100 per cent. The bridge is laid out to run from a point on Canal street, in New York, between Forsyth and Chrystie streets, passing over the East River between Pike Slip, New York, and landing in Brooklyn between the foot of Adams street and Washington street; thence in a continued straight line to a point on Myrtle avenue, between Gold and Prince streets; then curving and passing between these two last named streets to Willoughby street. The removal of the block between Willoughby and Fulton streets, and between Prince and Gold streets, is intended, so that direct access can be made to the proposed bridge. This route has several advantages; by the removal of comparatively few buildings of poor quality and low cost, the solving of the problem of a straight line thoroughfare from the junction of Atlantic and Flatbush avenues and the station of the Long Island Railroad, long contemplated, can be accomplished without changing the grade of the streets or interfering with the present location, and from the end of the bridge at Canal street, in New York, to the Bowery and Broadway, and thence uptown, or to the North River, where the ferries of the Western railroads are, or to the ocean steamer docks, all on the same water front, either in New York or New Jersey, connections can be had with every elevated or surface railroad, north or south. Apart from all this, the separation of the uptown travel in either city is readily made, and will help to do away with the present crowded condition of travel which prevails on Fulton street from the outlet of the present bridge on Sands street to the junction of Fulton street and De Kalb avenue, which, by the building of this bridge, will separate the uptown travel to Brooklyn from Canal street and beyond, and make it possible to reach the south and southeastern districts of Brooklyn in much less time than is now possible.

The total length is 9,330 feet.

I HEREBY CERTIFY that the foregoing is a true copy of a resolution adopted by the Board of Public Improvements at a regular meeting of said Board, held on the 6th day of December, 1899.

Dated December 6, 1899.

(Signed) JOHN H. MOONEY,
Secretary Board of Public Improvements.

AN ORDINANCE to provide for the construction of a bridge over the East River, between the Boroughs of Manhattan and Brooklyn, in The City of New York.

Be it ordained by the Municipal Assembly of The City of New York as follows:

Section 1—The building of a permanent bridge over the East River, between the Borough of Manhattan and the Borough of Brooklyn, in The City of New York, from, at or near the foot of Pike Slip in said Borough of Manhattan, to, at or near the foot of Washington street in said Borough of Brooklyn, and the approaches thereto, in accordance with the plans prepared under direction of the Commissioner of Bridges and approved by the Board of Public Improvements and filed in the office of the Commissioner of Bridges on the 29th day of November, 1899, is authorized and approved.

Section 2—The work of constructing said bridge and approaches, with the necessary piers and abutments, and of furnishing all materials and labor necessary therefor, shall be done by contract, let to the lowest responsible bidder by the Commissioner of Bridges of The City of New York, pursuant to the provisions of The Greater New York Charter, regulating the letting of contracts in The City of New York.

Section 3—The Comptroller of The City of New York shall, from time to time, when thereunto authorized by resolutions of this body and of the Board of Estimate and Apportionment, prepare and issue corporate stock of The City of

New York to the extent limited by such resolutions, bearing interest at not more than three and one-half per centum per annum, and redeemable from time to time, but not less than twenty years after the date thereof, for the purpose of defraying the expense of constructing the said bridge and approaches thereto, with the necessary abutments and appurtenances, and for the payment of salaries and wages of officers, engineers, surveyors and other subordinates and the expense of any and all condemnation proceedings, and any land condemned in said proceedings and the costs of any land which may be purchased for said abutments and approaches. Such corporate stock shall not be sold for less than the par value thereof, and the moneys received from the sale of the said corporate stock shall be deposited in the City Treasury, and shall be drawn and paid by the Comptroller of said City of New York for the several objects and purposes provided in this ordinance, upon vouchers in a form to be prescribed by the said Comptroller.

Section 4—The said bridge, when completed, shall be and become a public highway for the purpose of rendering travel between the Boroughs of Manhattan and Brooklyn safe and certain at all times.

Adopted by the Council December 30th, 1899.

Adopted by the Board of Aldermen December 30th, 1899.

Approved by the Mayor January 8th, 1900.

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THE CITY OF NEW YORK,

DEPARTMENT OF BRIDGES.

NOTICE TO CONTRACTORS.

PROPOSALS FOR BIDS OR ESTIMATES.

a. Bids or Estimates will be received by the Commissioner of Bridges of The City of New York at the Department of Bridges, Park Row Building, Borough of Manhattan, The City of New York, until two o'clock p. m.

[Ordinances, sections 345, 346, 351.]

Thursday. Aug. 10th., 1905.

For Furnishing the Metal Work for the Anchorages and Constructing the Towers, Cables, Suspenders and Suspended Superstructure of the Manhattan Bridge Over the East River, Between the Boroughs of Manhattan and Brooklyn.

b. All bids must be closed in sealed envelopes endorsed "Bid for Furnishing the Metalwork for the Anchorages and Constructing the Towers, Cables, Suspenders and Suspended Superstructure of the Manhattan Bridge over the East River, between the Boroughs of Manhattan and Brooklyn."

At two o'clock P. M. of Thursday. Aug 10th 1905 the bids will be publicly opened and read by the Commissioner.

[Ordinances, section 351.]

c. Bidders are required to make their bids or estimates upon the blank forms within, prepared by the Department.

d. Bidders are particularly requested to examine the plans, specifications and location of the work before bidding, and they are expressly notified that no deviation from the specifications will be allowed, unless the same has been previously authorized by, and written permission therefor obtained from, the Commissioner.

e. No bid will be considered which does not adhere strictly to the requirements prescribed herein and on the bidding sheet.

[Charter, section 419.]

f. No bid will be accepted from or contract awarded to any person who is in arrears to The City of New York, or who is a defaulter, as surety, contractor or otherwise, to The City of New York.

[Ordinances, section 347, chapter 327, Laws 1900.]

[Charter, section 1533.]

g. Each bid or estimate shall contain the name and place of residence of the person making the same, the names of all persons interested with him therein, and, if no other person be so interested, it shall distinctly state that fact; also, that it is made without any connection with any other person making an estimate for the same purpose, and is in all respects fair and without collusion or fraud, and that no member of the Board of Aldermen, head of a department, chief of a bureau, deputy thereof, or clerk therein, or other officer of The City of New York, is, shall be or become interested, directly or indirectly, as contracting party, partner, stockholder, surety or otherwise, in, or in the performance of the contract, or in the supplies, work or business to which it relates, or in any portion of the profits thereof. The bid or estimate must be verified by the oath, in writing, of the party or parties making the estimate, that the several matters stated therein are in all respects true.

[Charter, section 420.]

h. No bid will be received or considered which is not accompanied by either a certified check upon a State or National Bank of The City of New York, payable to the Comptroller of The City of New York, or money to the amount of five per cent. of the amount of the bond required for the faithful performance of the contract. Such check or money must not be inclosed in the envelope containing the bid, but must be handed to the official of the Department who receives the bids, for examination and approval before receiving the bid. All such deposits except that of the successful bidder will be returned by the Comptroller to the owners within three days after the contract is awarded.

[Ordinances, sections 349, 350, 356.]

i. Each estimate shall be accompanied by the consent, in writing, of two householders or freeholders in The City of New York, with their respective places of business or residence, or of a guaranty or surety company duly authorized by law to act as surety, to the effect that if the contract be awarded to the person or persons making the estimate they will, or it will, on its being so awarded, become bound as his or their sureties for its faithful performance; and that if he or they shall omit or refuse to execute the same, they will, or it will, pay to the Corporation any difference between the sum to which he or they would be entitled on its completion, and that which the Corporation may be obliged to pay to the persons to whom the contract may be awarded at any subsequent letting; the amount in each case to be calculated upon the estimated amount of the work by which the bids are tested. The consent above mentioned shall be accompanied by the oath or affirmation, in writing, of each of the persons signing the same, that he is a householder or freeholder in The City of New York, and is worth the amount of the security required for the completion of the contract and stated in the proposals, over and above all his debts of every nature, and over and above his liabilities as bail, surety or otherwise; that he has offered himself as surety in good faith, and with an intention to execute the bond required by law. The adequacy and sufficiency of the security offered will be determined by the Comptroller of The City of New York after the award is made and prior to the signing of the contract.

Price.

j. The price bid must be a lump sum covering the cost of all material and work as set forth in the accompanying Specifications and plans Nos. $\frac{33}{14}$, $\frac{33}{15}$, $\frac{33}{25}$,, $\frac{34}{4}$; $\frac{35}{1}$ to $\frac{35}{13}$, inclusive ; $\frac{36}{1}$, $\frac{36}{2}$, and $\frac{37}{2}$ to $\frac{37}{14}$, inclusive, which are to become part of the contract. The price shall cover not only such material and work as is set forth in the specifications and plans specifically and in detail, but such material and work as are reasonably implied to be required for the proper completion of the portions of the work above named.

Quantities.

k. Each bidder must calculate all quantities for himself and assume all responsibility therefor; and must accompany his bid with an itemized estimate of the quantities involved and the unit price of each item whereon his bid is based.

[Charter, section 419.]

l. If the successful bidder or bidders within five days after receiving notice of the award shall not attend at the Department of Bridges, together with the sureties offered by him or them, and execute the contract, and the sureties sign the bond; or if the sureties offered are not approved by the Comptroller and others are not provided by the bidder or bidders acceptable to the Comptroller, the bidder or bidders will be considered as having abandoned his or their bid, and the work will be readvertised and relet until a contract for the same be accepted and executed.

[Charter, section 420.]

m. In the event of such default on the part of the successful bidder or bidders, the deposit made by him or them shall be forfeited to and retained by The City of New York as liquidated damages because of such default. If the contract is duly executed by the bidder or bidders and the sureties for same duly qualify, the amount of the deposit will be returned to him or them.

[Ordinances, section 354.]

n. The Contractor will be required to begin work on this contract within ten days after receipt of instructions from the Commissioner of Bridges to begin, and shall complete the entire work to the satisfaction of the Commissioner and the Engineer, and in accordance with the plans and specifications as follows:

(1) Delivery at the bridge site of the metalwork for the anchorages shall begin in the order in which the Engineer shall designate, not later than January 1, 1906, and shall be completed not later than February 1, 1906.

(2) The construction of the towers shall begin as promptly as possible, and the entire work under this contract shall be completed not later than January 1, 1909.

o. Should the Commissioner for any cause authorize a suspension of work, the time of such suspension will be added to the time allowed for completion. Suspension of work by order of the Commisisoner shall not be ground for claim for damages by the Contractor, nor ground for waiver of The City's claim for damages for non-completion of the work, as above required. [Ordinances, section 356.]

p. The amount of security to guarantee the faithful performance of the work under this contract will be ONE MILLION FIVE HUNDRED THOUSAND DOLLARS ($1,500,000). [Ordinances, section 346.]

q. The right is reserved by the Commissioner to reject all bids should he deem it to the interest of The City of New York so to do. [Ordinances, section 351.] [Charter, section 419.]

As by far the greater part of this work can be executed only by bridge establishments of the first class, bids will be received only from such parties as have the requisite plant and facilities. The bidders must be, in the opinion of the Commissioner, fully qualified both by experience and in appliances to execute work of this character and importance according to the highest standard of bridge work at the present time.

GEORGE E. BEST,
Commissioner of Bridges.

Dated, The City of New York. July 18th ...., 1905.

Department of Bridges, Park Row Building,
Manhattan, The City of New York.

[NOTICE.—The attention of bidders is particularly called to the fact that unless their bids are made in conformity with the requirements of the forms of Bid and of the Contract and Specifications, such bids cannot be properly compared and will be *thrown out* as informal.]

THE CITY OF NEW YORK.

DEPARTMENT OF BRIDGES.

BID OR ESTIMATE.

To the Commissioner of Bridges:

For Furnishing the Metal Work for the Anchorages and Constructing the Towers, Cables, Suspenders and Suspended Superstructure of the Manhattan Bridge over the East River, between the Boroughs of Manhattan and Brooklyn.

The bidder's name and residence must be inserted here, and in case of firms, the name and residence of each and every member of the firm must be inserted.

Made this .... *day of* .... 1905.

by .... *residing at* ....

by .... *residing at* ....

by .... *residing at* ....

by .... *residing at* ....

1. I [We] ....

....

do declare that .... the only person interested in this estimate; and that no other person than is herein named has any interest in this estimate, or in the contract proposed to be taken.

2. further declare that this estimate is made without any connection with any other person or persons making an estimate for the same purpose, and is in all respects fair, and without collusion or fraud.

3. .... further declare that no member of the Board of Aldermen, head of a department, chief of a bureau, deputy thereof or clerk therein, or any other officer of The City of New York, is, shall be or become interested, directly or indirectly, as contracting party, partner, stockholder, surety or otherwise in this bid or estimate, or in the performance of the contract, work or business to which it relates, or in any portion of the profits thereof.

4. .... further declare that the names of the persons affixed to the consent hereto annexed were written by said persons respectively, and that said persons are householders, freeholders or are officers of a guaranty or surety company authorized by law to become surety in The City of New York.

5. .... ha carefully examined the annexed contract (including the specifications and plans), in the form approved by the Corporation Counsel, and.... .... will execute the contract and perform all its terms, covenants and conditions, and.... .... will furnish all the work, labor, materials, tools, plant and appliances necessary for furnishing the metal work for the anchorages and constructing the towers, cables, suspenders and suspended superstructure of the Manhattan Bridge over the East River, between the Boroughs of Manhattan and Brooklyn, in accordance with the plans, specifications and form of contract therefor, for the lump sum of

....

....Dollars ($................)

Including the cost of inspection at the mills, shops and in the field, taken at an aggregate cost of $1.20 per net ton.

The foregoing lump sum price is based upon the following estimate or schedule of quantities and unit prices therefor:

NOTE.—In case a bid shall be submitted by or in behalf of any corporation, it must be signed in the name of such corporation by some duly authorized officer or agent thereof, who shall also subscribe his own name and office. If practicable, the seal of the corporation should also be affixed.

Class of Work.	Total Quantity.	Unit Price.	Total Price.
Anchorage Material Delivered, *f. o. b.*, Bridge Site—			
Riveted work .... pounds	....	....	....
Eye bars .... pounds	....	....	....
Pins .... pounds	....	....	....
Steel castings .... pounds	....	....	....
Bronze .... pounds	....	....	....
Iron castings .... pounds	....	....	....
Towers—			
Riveted work, including architectural metal work .... pounds	....	....	....
Steel castings .... pounds	....	....	....
Iron castings .... pounds	....	....	....
Concrete, mortar, etc. ...... cubic yards	....	....	....
Lead for bedding base castings... pounds	....	....	....
Cables, Suspenders, etc.—			
Cables .... pounds	....	....	....
Suspenders, hand ropes, etc. .... pounds	....	....	....
Steel castings, including cable bands, strand shoes, anchorage saddles, rollers, etc. .... pounds	....	....	....
Iron castings .... pounds	....	....	....
Pins, bolts, nuts, etc. .... pounds	....	....	....
Bronze .... pounds	....	....	....
Zinc for suspender sockets ...... pounds	....	....	....
Lead fillers .... pounds	....	....	....
Carried Forward,			....

Class of Work.	Total Quantity.	Unit Price.	Total Price.
Brought Forward,			
Suspended Superstructure—			
Nickel steel or high carbon steel riveted work … pounds			
Medium carbon steel riveted work … pounds			
Steel castings … pounds			
Iron castings … pounds			
Pins … pounds			
Bronze … pounds			
Inspection … net tons		$1 20	
Total …			

This schedule will be used by the Engineer for his information in the preparation of partial estimates made during the progress of the work, for partial payments to be made thereon.

6. The undersigned herewith bind   to execute a contract for this work within five (5) days after the award of the same is made, and to furnish surety as required by the form of contract for this work.

7. Accompanying this bid is a certified check for Seventy-five Thousand Dollars ($75,000), payable to the Comptroller of The City of New York, which is to be forfeited to and retained by the said Comptroller, for said City, as liquidated damages, should the undersigned fail to execute said contract and furnish said surety.

………………………… [L. S.]

Residence, …………………………

………………………… [L. S.]

Residence, …………………………

………………………… [L. S.]

Residence, …………………………

………………………… [L. S.]

Residence, …………………………

Bidder(s) or Estimator(s).

Each and every person bidding and named above must sign here.

THE CITY, COUNTY AND STATE OF NEW YORK, } ss.:

Name(s) of Bidder(s).

the person or persons bidding for the contract; in case of a firm, by each and every member of the firm.

being severally duly sworn, say each for himself, that the several matters stated in the above estimate are in all respects true.

Subscribed and sworn to before me,
this *day of*
A. D. 1905.

Signature(s) of Bidder(s).

Notary Public or Commissioner of Deeds.

◆

SURETIES' AGREEMENT.

This consent must be signed by the two sureties, with their places of business or residence added.

In Consideration of the premises, and of One Dollar to us and each of us in hand paid by The City of New York, the receipt whereof is hereby acknowledged—

We, the undersigned, jointly and severally, consent and agree that if the contract for which the preceding estimate is made be awarded to the person making the same, we will, upon its being so awarded, become bound as his or their sureties for its faithful performance; and if the said person shall omit or refuse to execute such contract, if so awarded, and give the proper security within five days after written notice that the same is ready for execution, we will pay, without proof of notice or demand, to the said The City of New York, any difference between the sum to which such person or persons would be entitled upon the completion of such contract and the sum which The City of New York may be obliged to pay to the person or persons to whom the contract shall be awarded at any subsequent letting.

In Witness Whereof, we have hereunto set our hands this day of , one thousand nine hundred and five.

Residence

Residence

NOTE.—If the surety is a householder but not a freeholder, the word freeholder must be erased. If a freeholder but not a householder, the word householder must be erased.

Each of these depositions must be signed by one of the proposed bondsmen and sworn to.

The City, County and State of New York, ss.:

The above-named being duly sworn, says that he is a householder or freeholder in The City of New York, and is worth the sum of ONE MILLION FIVE HUNDRED THOUSAND DOLLARS ($1,500,000), over and above all his debts of every nature, *and over and above his liabilities as bail, surety and otherwise;* being the amount of the security required for the completion of the contract above referred to; that he has offered himself as a surety in good faith, and with an intention to execute the bond required by law, if the contract shall be awarded to the person for whom he consents to become surety.

Subscribed and sworn to before me, this
day of A. D. 1905.

Notary Public or Commissioner of Deeds.

The City, County and State of New York, ss.:

The above-named being duly sworn, says that he is a householder or freeholder in The City of New York, and is worth the sum of ONE MILLION FIVE HUNDRED THOUSAND DOLLARS ($1,500,000), over and above all his debts of every nature, *and over and above his liabilities as bail, surety and otherwise;* being the amount of the security required for the completion of the contract above referred to; that he has offered himself as a surety in good faith, and with an intention to execute the bond required by law, if the contract shall be awarded to the person for whom he consents to become surety.

Subscribed and sworn to before me, this
day of A. D. 1905.

Notary Public or Commissioner of Deeds.

The adequacy and sufficiency of the above-named sureties approved.
Dated this day of 1905.

Comptroller.

THE CITY OF NEW YORK,

DEPARTMENT OF BRIDGES.

1905.

CONTRACT

For Furnishing the Metal Work for the Anchorages and Constructing the Towers, Cables, Suspenders and Suspended Superstructure of the Manhattan Bridge over the East River, between the Boroughs of Manhattan and Brooklyn.

THIS AGREEMENT, made and entered into this day of in the year one thousand nine hundred and five by and between The City of New York, party of the first part, by the Commissioner of Bridges of the Department of Bridges, pursuant to Resolutions of the Board of Public Improvements, adopted November 30th, 1898, and December 6th, 1899, and of the Municipal Assembly, entitled "An Ordinance to Provide for the Construction of a Bridge over the East River, between the Boroughs of Manhattan and Brooklyn, in The City of New York," adopted December 30th, 1899, and approved by the Mayor, January 8th, 1900, and pursuant to The Greater New York Charter, and............................ Parties.

....

....

....

....

....

Contractor (s), party of the second part.

Covenant.

WITNESSETH, That the parties of these presents, each in consideration of the agreements on the part and behalf of the other herein contained, have mutually agreed, and hereby mutually agree, the party of the first part for itself and its successors, and the party of the second part for himself and his executors and administrators, as follows:

Parties described.

A. Wherever in this agreement the word "Contractor," or a pronoun in the place of him or them, is used, the same shall mean and intend the party of the second part; wherever the words "The City" or pronoun designating the same appears, the same shall mean The City of New York acting by or through the Commissioner of Bridges; wherever the word "Commissioner," or a pronoun designating the same, appears, it shall mean the Commissioner of Bridges of The City of New York.

B. Wherever the word "Engineer" is used in this contract or the accompanying specifications, it refers to and designates the Chief Engineer of the Department of Bridges or other engineer designated by the Commissioner to act in his stead, or any assistant designated by the Chief Engineer having immediate charge of any portion of the work limited by the particular duties entrusted to him. Wherever the word "Inspector" is used, it shall be taken to mean the Inspector appointed by the Engineer, at the mills, shops, or in the field. Wherever it is provided that anything is to be, or to be done, if or as, or when or where "approved," "required," "directed," "specified," "designated" or "deemed necessary," it shall be taken, unless otherwise expressed, to mean and intend approved, required, directed, specified, designated or deemed necessary, as the case may be, by the Engineer.

C. The Contractor will, for the price fixed in accordance with the conditions herein agreed upon and determined, furnish all the material, labor, plant, tools and appliances, necessary or proper for the purpose, and in a good, substantial and workmanlike manner, according to the specifications and plans, and to the satisfaction of the Engineer and of the Commissioner, furnish the metalwork for the anchorages and construct the towers, cables, suspenders and suspended superstructure of the Manhattan Bridge over the East River between the Boroughs of Manhattan and Brooklyn.

Contractor responsible for estimates of quantities.

[Charter, sections 413, 414.]

D. Neither the Department of Bridges nor The City is to be held responsible for the estimates of the quantities of material to be furnished or work to be done.

The Contractor has judged for himself as to such estimates as well as to the conditions to be met which will affect both the cost and time required for the execution of the work, and assumes all responsibilities therefor.

Scope of work.

E. The Contractor shall furnish, deliver, build, construct, finish and fully complete the whole of the work as described, in a substantial and workmanlike manner, as shown in the specifications and by the drawings numbered $\frac{33}{14}$, $\frac{38}{15}$, $\frac{33}{25}$, $\frac{34}{4}$; $\frac{35}{1}$ to $\frac{35}{13}$, inclusive; $\frac{36}{1}$, $\frac{36}{2}$, and $\frac{37}{2}$ to $\frac{37}{14}$, inclusive, and in accordance with such further details and instructions as the Engineer may from time to time furnish, approve or issue for the purpose of insuring the thorough completion of the work in the most efficient and expeditious manner.

Parts of contract.

F. The Specifications and Plans, together with the Proposal for Bids or Estimates, the Bid or Estimate and the Bond are hereby made and declared a part of this contract.

Specifications and plans to be reconciled.

G. The specifications and plans and drawings are intended mutually to explain each other, and anything which is shown on any of the plans or drawings, and not mentioned or referred to in the specifications, or which is referred to in the specifications and not shown on the plans and drawings, shall be considered as being both so shown and mentioned or referred to, and shall be done and performed accordingly, excepting work which may be mentioned in the specifications as being excluded from this contract.

Engineer to correct errors in contract, specifications and drawings.

H. The Engineer shall have the right of correcting any errors or omissions in the specifications and drawings, when such correction is necessary for the proper completion of the work herein stipulated and for the proper fulfillment of their intention; the action of such correction to date from the time that the Engineer gives due notice thereof, it being further understood that if such correction should increase the cost of the work to the Contractor it shall be considered as extra work as hereinafter provided for.

Engineer to explain.

I. Any doubt as to the meaning of these specifications, or any obscurity as to the wording of them, will be explained by the Engineer, and all directions and explanations requisite or necessary to complete, explain or make definite any of the provisions of these specifications and give them due effect will be given by the Engineer.

Engineer to decide.

[Charter, sections 453, 455.]

J. To prevent all disputes and litigations, the Engineer, shall in all cases determine the amount or the quality of the several kinds of work which are to be paid for under this contract, and he shall determine all questions in relation to said work and the construction thereof; and he shall in all cases decide every question which may arise relative to the execution of this contract on the part of the Contractor, and his estimate and decision shall be final, conclusive and binding, and such estimate and decision, in case any question shall arise, shall be a condition precedent to the right of the Contractor to receive any money under this agreement.

Inspectors.

K. The Engineer shall be and is hereby authorized to appoint such inspectors or other persons as he shall deem necessary to inspect the materials and labor furnished and done under this agreement, and to see that the same correspond with the specifications, plans and drawings, and the terms and intent thereof.

Condemned material.

L. If the work, or any material brought on the ground for use in the work, or selected for the same, shall be condemned by the Engineer as unsuitable or not in conformity with the specifications, the Contractor shall forthwith remove such material from the work.

M. All the work, labor and materials, done and furnished not to the satisfacton of the Commissioner and the Engineer shall be immediately made good by the Contractor. But if such work or materials as may be condemned by the Engineer be not removed and replaced when notice is given by the Engineer, or if the Contractor shall neglect or refuse to remove the materials or any rubbish to the place or places and in the manner required by the Engineer, then the Commissioner may remove or cause the same to be removed or satisfactorily replaced, by contract or otherwise, as he may deem expedient, and charge the expense thereof to the Contractor, and the expense so charged shall be deducted and paid by The City out of such moneys as are or may be due to the Coutractor under this agreement.

Engineer to replace poor work.

N. The Contractor shall use such appliances, and employ such a number of men for the performance of all the operations connected with the work embraced under this contract as will secure a satisfactory quality of work, and a rate of progress which, in the opinion of the Engineer, will secure the completion of the work within the time specified. If at any time before the commencement or during the progress of the work, such appliances appear to the Engineer to be inefficient or inappropriate for securing the quality of the work required or the said rate of progress, he may order the Contractor to increase their efficiency or to improve their character, and the Contractor shall promptly conform to such order; but the failure of the Engineer to demand such increase of efficiency or improvement shall not relieve the Contractor from his obligation to secure the quality of work and the rate of progress established in these specifications.

Appliances to be efficient.

O. The Contractor, in the prosecution of the work required under this contract, will employ no patented method of construction, nor furnish any appliance the operation of which is patented, except such methods or appliances as are either owned or controlled by him, and that he will hold himself responsible for any claims made against The City for any infringement of patents by the use of patented articles in the construction and completion of the work, and further agrees that The City shall be and is hereby authorized to deduct and retain out

The City to be protected against infringement of patents.

[Charter, section 1554.]

the moneys which may be due or become due to the Contractor under this agreement, a sum sufficient to cover all claims for damages arising from such infringements, and to retain the same until the settlement or other disposition of said claims.

Permits.

P. All permits required by The City, State or Federal authorities in connection with use of streets, construction of temporary docks, etc., must be obtained by the Contractor.

Damage to life or property.

Responsibility of Contractor.

Contractor to maintain guards and lights.

[Ordinances, section 355.]

. Q. The Contractor shall be responsible for all damage to life and property due to his operations, and also responsible for all parts of the work, both temporary and permanent, until the contract is declared discharged by the Commissioner. He shall furnish and place proper guards for the prevention of accidents and shall put up and keep at night suitable and sufficient lights where necessary, during the delivery of the materials or supplies, to prevent accidents or injuries to the person or property of another, and he will indemnify and save harmless The City from all suits, or actions, and damages or costs of every name and description to which The City may be subjected or put by reason of injury to the person or property of another resulting from negligence or carelessness on the part of the Contractor, his servants or agents in the delivery of the materials and supplies, or by or on account of any act or omission of the Contractor, his servants or agents, and the whole or so much of the moneys due, or to grow due, the Contractor under this agreement, as shall or may be considered necessary by the Comptroller of The City, shall or may be retained by The City until all suits or claims for damages shall have been settled or otherwise disposed of, and evidence to that effect furnished to the satisfaction of the Comptroller.

Character of employees.

R. The Contractor shall employ, on all parts of the work herein contracted for, only competent and trustworthy men, and should the Engineer at any time give notice in writing to the Contractor, or his representative on the work, that any employee is insolent, disorderly, careless, unobservant of instructions, dishonest, or in any way a detriment to the satisfactory progress of the work, such employee shall at once be dismissed, and not again allowed upon the work. The

Contractor shall have and keep at all times on the work during the progress of the same, an expert and reliable foreman or superintendent, who shall have on hand at all times copies of drawings, specifications and contract, and all instructions given to such foreman or superintendent shall be deemed as having been given to the Contractor.

Protection of finished work.

S. The Contractor shall take proper precautions, under the directions of the Engineer, to protect the finished work from injury or disfigurement pending the completion of the entire contract. Such precautions shall not relieve the Contractor from the obligation to make good any damage to the finished work which may be incurred during construction.

Fire.

T. The Contractor shall take proper precautions, under the direction of the Engineer, to protect from fire all falsework and other inflammable material utilized in the construction.

Property available for use.

U. The Contractor shall have use of such parts of the areas acquired by The City for the work under this contract as is, in the opinion of the Engineer, necessary to conduct his operations without undue restraint. For the use of any other property the Contractor must make his own provisions and arrangements.

Commencement of work.

V. The Contractor will begin the work herein agreed to be performed on such dates as the Commissioner shall notify him to begin. The time hereinafter provided for the completion of the work shall begin to run on and from the dates so fixed. The place where the work is to be begun will either be stated in said notice or designated on the ground by the Engineer. The commencement of the work by the Contractor shall be deemed and taken to be a waiver of notice on his part.

Time of performance.

[Ordinances, section 354.]

W. The Contractor will carry on the work with such force and in such manner and order, and at such times and seasons as may be directed by the Engineer. He will execute all the work, in every respect, in a thorough and workmanlike manner; and he will fully and entirely perform this contract on his part so that delivery at the bridge site of the metalwork for the anchorages shall begin not later than January 1, 1906, and be completed not later than February 1, 1906; and the towers, cables, suspenders and suspended superstructure shall be completed, as required by accompanying plans and specifications, not later than January 1, 1909.

The length of time expressed in days or parts of days during which the work or any part thereof has been delayed in consequence of any act or omission of The City (all of which shall be determined by the Engineer, who shall certify the same in writing, and whose determination and certificate thereof shall be binding and conclusive upon the Contractor), shall be allowed to the Contractor and excluded from said computation. No demand by the Contractor that the Engineer determine and certify the matters aforesaid shall be of any effect whatsoever unless the same be made in writing and duly served upon the Commissioner prior to filing in the office of the Comptroller of The City the final certificate of the completion and acceptance of the work.

Liquidated damages.

[Ordinances, section 354.]

X. In case the Contractor shall fail to fulfil this contract in accordance with the specifications and to the satisfaction of the Commissioner and Engineer within the time aforesaid, either by reason of his failing to begin delivery at the bridge site of the metalwork for the anchorages on or before January 1, 1906, or failing to complete delivery on or before February 1, 1906; or failing to complete the balance of the contract on or before January 1, 1909, the Contractor shall and will pay to The City the sum of FIVE HUNDRED DOLLARS ($500) for each and every calendar day the time consumed in said performance and completion may extend beyond the dates hereinbefore named for said performance and completion; which said sum, in view of the difficulty of ascertaining the loss which The City will suffer by reason of delay in the performance of the work hereunder, is hereby agreed upon, fixed and determined by the parties hereto as the liquidated damages that The City will suffer by reason of said delay and default, and not as a penalty; and The City shall and may deduct and retain the amount of such liquidated damages out of the moneys which may be due or become due to the Contractor under this agreement.

Y. If the work be delayed by any act or omission of The City, or for the reason that The City does not own or has not obtained possession of, or the right to enter upon, the land upon which the work is to be performed, or for the reason that that portion of the anchorages which must be completed before the construction of the cables is begun has not been completed ready for use by the time it is required for cable construction, the Commissioner shall then extend the time for the completion of the work for such period as the Engineer shall certify that the work has been delayed. But no allowance for damages shall be made to the Contractor because of such delay. Neither an extension of time, for any reason, beyond the date fixed herein for the completion of the contract, nor the delivery and acceptance of any articles or materials called for by this contract, shall be deemed to be a waiver by the Commissioner of the right to abrogate this contract for abandonment or delay in the manner herein provided.

Delay in securing site.

Extension of time.

Extension not a waiver.

Z. If the Contractor shall complete and fully perform all the work of this contract before January 1st, 1909, he shall receive, as a bonus for such earlier completion of the work, an additional sum of FIVE HUNDRED DOLLARS ($500) for each and every calendar day between the date on which the work shall be fully completed and January 1st, 1909, but the total amount to be paid by The City, and to be received by the Contractor as said aggregate bonus, shall not exceed FIFTY THOUSAND DOLLARS ($50,000). The date of the full completion of the contract shall be determined by a certificate, in writing, of the Engineer, approved by the Commissioner of Bridges and the Corporation Counsel, and such certificate shall be final, conclusive and binding, and its execution and delivery shall be a condition precedent to the right of the Contractor to receive any money as a bonus for completing the work before the expiration of the time specified. Such bonus shall not be construed in any sense as a part of the Contractor's expected profits; and in no event shall it be paid unless all the work is fully completed.

Bonus for expeditious work.

AA. Upon the completion of the work and the removal of all falsework, plant or rubbish from the site, according to the terms of the contract, the Engineer will determine the number of days or parts of days between the date

Certificate of completion.

named for the complete performance of this contract and the date on which the work was actually completed, according to the terms of this contract, and shall certify the same in writing, and such determination and certificate thereof shall be conclusive and binding on the Contractor, and shall be a condition precedent to the right of the Contractor to receive the final payment upon said contract.

Commissioner may suspend work.

[Ordinances, section 356.]

BB. The Commissioner may suspend the whole or any part of the work herein contracted to be done, if he shall deem it for the interest of The City so to do, without compensation to the Contractor for such suspension, other than extending the time for completing the work as much as it may have been, in the opinion of the Engineer, delayed by such suspension.

Prices.

CC. The Contractor shall receive the following sum as full compensation for furnishing all the labor and all the materials which he has herein agreed to furnish, and in all respects performing and completing the whole of the work which he has herein agreed to perform and complete, to wit:

For furnishing all the metalwork for the Anchorages, and for furnishing all materials, plant, tools, labor, etc., necessary for constructing and completing, as hereinafter specified, the towers, cables, suspenders and suspended superstructure, the sum of..

.... dollars

($..............). Including the cost of inspection at the mills, shops and in the field taken at an aggregate cost of $1.20 per net ton.

No extras unless ordered.

DD. The Contractor will not ask, demand, sue for or recover for any materials furnished or work done under this contract, any extra compensation beyond the amounts payable for the work herein enumerated, which shall be actually performed and which are herein agreed upon, unless the same is approved in writing by the Engineer and the Commissioner and a price therefor agreed upon before the work is begun.

EE. No claim for extra or additional work or materials shall be made by or allowed to the Contractor, unless before the performance of such extra or additional work the Commissioner shall have first authorized the same in writing, and the price or prices to be paid therefor shall first have been agreed upon in writing between the Commissioner and the Contractor, and the same shall have been done or furnished under a written order from the Commissioner given before the performance of such extra or additional work or the furnishing of such extra or additional materials. The aggregate price to be paid for extra or additional work or materials so authorized or ordered shall not exceed five per cent. (5%) of the contract price or total cost of the work and materials. All claims for extra or addtional work or materials in any month shall be made to the Engineer, in writing, before the 15th day of the following month, and failing to make such claim within the time required the rights of the Contractor to extra pay for such extra or additional work or materials shall be deemed to have been waived and forfeited.

Extra work ordered in writing.

Accounts to be rendered.

FF. If, before the completion of the work contemplated herein, it shall become necessary to do any other or further work than is provided for in this contract, the Contractor will not in any way interfere with or molest such other person or persons as the Commissioner may employ to do such work, and will suspend such part of the work herein specified, or will carry on the same in such manner as may be ordered by the Engineer, to afford all reasonable facilities for doing such work; and no other damage or claim by the Contractor therefor shall be allowed, except such extension of the time specified in this contract for the performance thereof as the Commissioner may deem reasonable and shall so certify in writing.

Work of other contractors in connection with this.

GG. This contract and the specifications herein contained, and the plans hereafter referred to, may be modified and changed from time to time as may previously be agreed to in writing between the parties hereto, in a manner not materially affecting the substance thereof, or increasing the price to be paid, in order to carry out and complete more fully and perfectly the work herein agreed to be done and performed.

Contract may be modified.

Changes and alterations.

HH. If the conditions, at any time prevailing, require changes or alteration to be made, such changes shall be made and the work and materials required to be furnished to effect such changes, shall be made, done and furnished by the Contractor as under and a part of this agreement, and if such changes increase or decrease the cost of the work to the Contractor, of which the Engineer shall be sole judge, a reasonable addition to or deduction from the contract price shall be made and determined by the Engineer. If the work and materials required by such changes shall be different from those required or specified or reasonably implied by the terms and conditions set forth in this contract, specifications, plans and bid, then the increased or decreased cost of such work and materials shall be the subject of a supplemental written agreement by and between the parties as herein provided, by which the actual cost thereof shall be determined and fixed.

Progress payments.
[Ordinances, sections 353, 366.]

II. In order to enable the Contractor to prosecute the work advantageously, the Engineer shall, from time to time, as the work progresses, not oftener than once a month, make an estimate of the amount of work done under this contract since the last preceding estimate was made. In the preparation of such estimates the Engineer shall determine:

(1) The amount and value of material delivered at the shops,

(2) The amount and value of material manufactured and delivered at the bridge site ready for erection.

(3) The amount and value of material erected in place.

Partial estimates in anchorage material.

JJ. In these partial estimates of the material for the anchorages, the value of the material delivered at the shops will be taken at 50 per cent. of the value of the material delivered at the bridge site, and the value of the material delivered at the bridge site will be the full value of the material furnished under the contract.

KK. In these partial estimates of the material for the towers, cables, suspenders and suspended superstructure, the value of material delivered at the shops from the mills will be taken at 40 per cent. of the value of the material in the completed structure; the value of material manufactured and delivered at the bridge site ready for erection will be taken at 70 per cent. of the value of the material in the completed structure; and the value of the material in the structure and permanently connected up will be taken at the full value of the material in the completed bridge.

Partial estimates on towers, cables, etc.

LL. Upon the filing of these partial estimates above named, signed by the Enginer and the Commissioner, in the Office of the Comptroller of The City of New York, eighty-five per cent. (85%) of the estimated value of the work done covered by such estimates shall be paid to the Contractor.

Payment on partial estimates.

MM. Whenever in the opinion of the Engineer the Contractor shall have fully completed the manufacture and delivery of the metalwork for the anchorages, he shall prepare an estimate of the total value of this work, deducting only such sum or sums as by the terms of this contract may be deducted, and upon the filing of such estimate, signed by the Engineer and Commissioner, in the Office of the Comptroller of The City of New York, the total value of this portion of the work as shown by such estimate shall be paid to the Contractor.

Payment on final estimate for anchorage material.

NN. Whenever in the opinion of the Engineer the Contractor shall have completely performed all parts of this contract, the Engineer shall so certify in writing to the Commissioner.

Final certificate.

OO. When said certificate shall have been approved, and signed, by the Commissioner and the same has been filed with the Comptroller, The City will, on or before the expiration of thirty days after such completion and delivery of said certificate pay, and it hereby binds itself to pay, to the Contractor, in cash, the whole amount of money accruing to the Contractor under this contract, excepting such sum or sums as shall have been paid to the Contractor under any of the foregoing provisions of this contract, and such as may be lawfully retained

Final payment.

under any of the provisions of this contract hereinbefore set forth, provided that nothing herein contained be construed to affect the right hereby reserved of the Commissioner to reject the whole or any portion of the aforesaid work, should the said certificates or any of them be known to be inconsistent with the terms of this agreement or otherwise improperly given.

[Charter, section 423.]

PP. The payments herein provided for are to be made out of moneys provided for the prosecution of the work of constructing this bridge by The City, and these presents do not bind the Commissioner or his successors personally; but his actions in the premises are official only and binding The City and the funds specially provided for such purpose, in conformity with the ordinance under which authority was vested in the Commissioner, to proceed with the construction of this bridge.

Condition precedent.

QQ. The Contractor shall not be entitled to demand or receive payment for the work or materials, or any portion thereof, except in the manner set forth in this agreement, nor unless each and every one of the promises, agreements, stipulations, terms and conditions herein contained on his part to be performed, kept, observed and fulfilled, has been performed, kept, observed and fulfilled, and the Engineer shall have given his certificate to that effect.

Estoppel.

RR. The City shall not, nor shall any department or officer thereof, be precluded or estopped by any return or certificate made or given by the Commissioner, any Engineer or other officer, agent or appointee of The City under any provision of this agreement from at any time (either before or after the final completion and acceptance of the work and payment therefor pursuant to any such return or certificate) showing the true and correct amount and character of the work done and materials furnished by the Contractor, or any other person under this agreement, or from showing at any time that any such return or certificate is untrue and incorrect, or improperly made in any particular, or that the work and materials, or any part thereof, do not in fact conform to the specifications; and The City shall not be precluded or estopped, notwithstanding any such return or certificate and payment in accordance therewith, from demanding and recovering from the Contractor such as it may sustain by reason of his failure to comply with the specifications.

SS. The action of the Engineer by which the Contractor is to be bound and concluded according to the terms of this contract, shall be that evidenced by his final certificate, all prior certificates or estimates, upon which partial payments may be made, being merely approximate estimates, and being made for an amount that shall represent the ratio that the cost of the work done and materials furnished bears to the cost of the total amount of work and materials required by, and to be furnished under the contract, and which estimates are subject to the corrections of such final certificate, which may be made without notice to the Contractor thereof, or of the basis upon which the same is determined.

Final certificate.

TT. The Contractor will furnish the Commissioner with satisfactory evidence that all persons who have done work or furnished materials under this agreement, and who may have given written notice to the Commissioner before or within ten days after the final completion and acceptance of the whole work under this contract, that a balance for such work or materials is due and unpaid, have been fully paid or satisfactorily secured; and in case such evidence is not furnished as aforesaid, such amount as may be necessary to meet the claims of the persons aforesaid may be retained from the money due the Contractor under this agreement, until the liabilities aforesaid shall be fully discharged or such notice withdrawn.

Evidence that wages, etc., are paid.

[Ordinances, section 354.]

UU. If at any time before or within thirty days after the whole work herein agreed to be performed has been completed and accepted by The City, any person or persons claiming to have performed any labor or furnished any material toward the performance or completion of this contract, shall file with the Department of Bridges and with the Comptroller of The City, any such notice or lien as is described in The Lien Law or any lien law of the State of New

Liens.

[Chapter 418, Laws 1897; chapter 169, Laws 1898.]

York, then and in every case The City shall retain, anything herein contained to the contrary thereof notwithstanding, from the moneys under its control or due or to grow due under this agreement, so much of such moneys as shall be sufficient to pay off, satisfy and discharge the amount of such notice alleged or claimed to be due to the person or persons filing such notice, together with the reasonable costs of any such action or actions brought to enforce such claims or the lien created by the filing of such notice. The moneys so retained shall be retained by The City until the lien thereon created by the said act and the filing of said notice shall be discharged pursuant to the provisions of the said act.

Not to sublet.
[Chapter 444, Laws 1897.]

XV. The Contractor will give his personal attention constantly to the faithful prosecution of the work; he will not assign, transfer, convey, sublet or otherwise dispose of this contract, or his right, title or interest in or to the same or any part hereof, without the previous consent in writing of the Commissioner indorsed hereon or hereto attached; and he will not assign, by power of attorney or otherwise, any of the moneys to become due and payable under this contract, unless by and with the like consent signified in like manner. If the Contractor shall, without such previous written consent, assign, transfer, convey, sublet or otherwise dispose of this contract, or of his right, title or interest therein, or any of the moneys to become due under this contract, to any other person, company or other corporation, this contract may, at the option of the Commissioner, be revoked and annulled and The City shall thereupon be relieved and discharged from any and all liability and obligations growing out of the same to the Contractor, and to his assignee or transferee; providing that nothing herein contained shall be construed to hinder, prevent or affect an assignment by the Contractor for the benefit of his creditors, made pursuant to the statutes of the State of New York; and no right under this contract, or to any money to become due hereunder shall be asserted against The City in law or in equity, by reason of any so-called assignment of this contract, or any part thereof, or of any moneys to grow due hereunder, unless authorized as aforesaid by the written consent of the Commissioner.

WW. If the work to be done under this agreement shall be abandoned by the Contractor, or if this contract shall be assigned or said work sublet by him, otherwise than as herein specified, or if at any time the Engineer shall be of opinion, and shall so certify in writing to the Commissioner, that the performance of the contract is unnecessarily or unreasonably delayed, or that the Contractor is wilfully violating any of the conditions or covenants of this contract, or executing the contract in bad faith, the Commissioner shall have the power to notify the Contractor to discontinue all work or any part thereof under this contract, by a written notice to be served upon the Contractor, either personally or by leaving said notice at his residence or with his agent in charge of the work; and thereupon the Contractor shall discontinue said work or such part thereof as the Commissioner may designate, and the Commissioner shall thereupon have the power to contract for the completion of the work in the manner prescribed by law and to place such and so many persons and obtain by purchase or hire such plant, implements, tools and materials as the Commissioner may deem advisable, to work at and to be used to complete the work herein described, or such part thereof as he may deem advisable; and to procure materials for the completion of the same, and to charge the cost and expense thereof to the Contractor; and the expense so charged shall be deducted and be paid by The City out of such moneys as either may be due or may at any time thereafter become due to the Contractor, under and by virtue of this agreement or any part thereof; and in case such expense shall exceed the sum which would have been payable under this contract if the same had been completed by the Contractor, then the Contractor will pay the amount of such excess to The City, and when any particular part of the work is being carried on by the Commissioner by contract or otherwise, under the provisions of this clause of this contract, the Contractor agrees to continue the remainder of the work in conformity with the terms of this agreement, and in such manner as in no wise to hinder or interfere with the persons or workmen employed as above provided by the Commissioner, by contract or otherwise, to do any part of the work, or to complete the same under the provisions of this clause of the contract.

Default of Contractor.

Notice to Contractor.

Contractor's place of business.

XX. The residence or place of business, given in the bid or estimate upon which this contract is founded, is hereby designated as the place where all notices, letters and other communications shall be served, mailed or delivered.. Any notice, letter or other communication addressed to the Contractor and delivered at the above-named place, or deposited in a post-paid wrapper in any post-office box regularly maintained by the post-office shall be deemed sufficient service thereof upon the Contractor. The place named may be changed at any time by an instrument in writing, executed and acknowledged by the Contractor and delivered to the Commissioner. Nothing herein contained shall be deemed to preclude or render inoperative service of any notice, letter or other communication upon the Contractor personally.

Comptroller's certificate.

Charter, section 234.]

YY. This contract shall not be binding or of any force unless the Comptroller of The City shall indorse hereon his certificate that there remains unexpended and unapplied, as provided in The Greater New York Charter, a balance of the appropriation or fund applicable thereto sufficient to pay the estimated expense of executing this contract, as certified by the officers making the same.

IN WITNESS WHEREOF, The Commissioner of Bridges has hereunto set his hand and seal on behalf of The City of New York, and the Contractor has also hereunto set his hand and seal, the day and year first above written; and the Commissioner and Contractor have executed this agreement in triplicate, one part of which is to remain with the Commissioner, one other to be filed with the Comptroller of The City, and the third to be delivered to the Contractor the day and date herein first above written.

.................................[L. S.]

Commissioner of Bridges.

.................................[L. S.]

.................................[L. S.]

.................................[L. S.]

.................................[L. S.]

Contractor(s).

THE CITY, COUNTY AND STATE OF NEW YORK, ss. :

On this......................day of......................., 1905, before me personally came GEORGE E. BEST, to me known and known to me to be the Commissioner of Bridges, the person described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same as such Commissioner for the purposes therein mentioned.

....

Notary Public or Commissioner of Deeds.

Notarial Certificate for Officers of Corporation.

THE CITY, COUNTY AND STATE OF NEW YORK, ss. :

On this......................day of.........................1905,

before me personally came...

to me known and known to me to be the...............................

of the...Company, and

....

to me known and known to me to be the...............................

of the ....Company, and who, being by me severally duly sworn, did say, each for himself, as follows:

The said..that he

is the.......................................of said Company,

and the said..

that he is the...................................of said Company; that he knows the corporate seal of said company; that the seal affixed to the foregoing instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said Company, and that, by like order, he thereto signed his name and official designation.

....

Notary Public or Commissioner of Deeds.

Notarial Certificate for Individuals.

THE CITY, COUNTY AND STATE OF NEW YORK, ss.:

On this......................day of......................1905,

before me personally came...

....

....

to me known and known to me to be the same person(s) described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same for the purposes therein mentioned.

....

Notary Public or Commissioner of Deeds.

Bond.

KNOW ALL MEN BY THESE PRESENTS, THAT WE................

....

....

....

....

....

.................................of The City of New York, are held and firmly bound unto THE CITY OF NEW YORK, in the sum of ONE MILLION FIVE HUNDRED THOUSAND DOLLARS ($1,500,000), lawful money of the United States of America, to be paid to THE CITY OF NEW YORK, or to its certain Attorneys, Successors or Assigns, for which payment well and truly to be made, we bind ourselves, and our several and respective Heirs, Executors and Administrators, jointly and severally, firmly by these presents.

Sealed with our seals. Dated this..........................day of

.........................., in the year one thousand nine hundred and five.

WHEREAS, the above bounden....................................

....

....

by an instrument in writing, under hand and seal , and bearing even date with these presents, ha contracted with The City of New York to perform all the work and furnish all the materials and plant called for in the preceding contract,

For Furnishing Metalwork for the Anchorages and Constructing the Towers, Cables, Suspenders and Suspended Superstructure of the Manhattan Bridge Over the East River, between the Boroughs of Manhattan and Brooklyn.

Now, therefore, the conditions of the above obligations are such, that if

the said above-bounden..

....

....

or assigns, shall well and truly, and in a good, sufficient and workmanlike manner, perform the work mentioned in the aforesaid agreement, in accordance with the terms and provisions therein stipulated, and in each and every respect comply with the conditions and covenants therein contained, then this obligation to be void; otherwise to remain in full force and virtue.

This bond shall remain in force from the execution of the contract until the completion and acceptance of the work hereinbefore designated. It shall terminate upon such completion, and the written acceptance of the work, signed by the Commissioner of Bridges and the Chief Engineer of the Department of Bridges, shall be considered as a cancellation of this bond.

..................................[L. S.]

..................................[L. S.]

..................................[L. S.]

..................................[L. S.]

Notarial Certificate for Officers of Corporation.

THE CITY, COUNTY AND STATE OF NEW YORK, ss. :

On this. .day of. 1905,

before me severally and personally came. . . . .

to me known and known to me to be the. . . . . .of the

. . . . .Company, and

. . . .

to me known and known to me to be the. . . . . .of said

. . . . Company,
who, being by me severally duly sworn, did say, each for himself, as follows:

The said. . . . . .that he

is the . . . . .of said Company, and

the said. . . . .

that he is the. . . . . .of said Company; that he knows the corporate seal of said Company; that the seal affixed to the foregoing instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said Company, and that by like order he thereunto signed his name and official designation.

. . . .

Notary Public, No. *New York County.*

Notarial Certificate for Individual Bondsmen.

THE CITY, COUNTY AND STATE OF NEW YORK, ss.:

I, ... of said City, being duly sworn, do depose and say, that I am a.............. holder in The City of New York, and.. Street, in The City, and that I am worth the sum of ONE MILLION FIVE HUNDRED THOUSAND DOLLARS ($1,500,000), over and above all my debts and liabilities, including my liabilities as bail, surety or otherwise, and over and above all my property, which is exempt by law from execution.

Subscribed and sworn to before me this
......day of..............1905.

....

Notary Public or Commissioner of Deeds.

THE CITY, COUNTY AND STATE OF NEW YORK, ss.:

I, ... of said City, being duly sworn, do depose and say, that I am a.............. holder in The City of New York, and.. Street, in The City, and that I am worth the sum of ONE MILLION FIVE HUNDRED THOUSAND DOLLARS ($1,500,000), over and above all my debts and liabilities, including my liabilities as bail, surety or otherwise, and over and above all my property, which is exempt by law from execution.

Subscribed and sworn to before me this
......day of..............1905.

....

Notary Public or Commissioner of Deeds.

BOND ACCOUNT.

COMMISSIONER'S CERTIFICATE.

In conformity with the provisions of section 149 of The Greater New York Charter, it is hereby certified that the estimated cost of the work, materials and supplies required by the within contract, amounting to....................

....

................................dollars ($............) is chargeable to the fund of the Department of Bridges, entitled "Bridge over the East River, between the Boroughs of Manhattan and Brooklyn," construction of which is authorized by resolutions of the Board of Public Improvements, adopted November 30th, 1898, and December 6th, 1899, and of the Municipal Assembly, adopted December 30th, 1899, and approved by the Mayor January 8th, 1900, as provided by The Greater New York Charter.

....

Commissioner of Bridges.

The City of New York.......................1905.

COMPTROLLER'S CERTIFICATE.

The City of New York..................1905.

In pursuance of the provisions of section 149 of The Greater New York Charter, I hereby certify that there remains unapplied and unexpended a balance of the fund applicable to this contract, under The Greater New York Charter and pursuant to resolutions of the Board of Public Improvements, adopted November 30th, 1898, and December 6th, 1899, and of the Municipal Assembly, adopted December 30th, 1899, and approved by the Mayor January 8th, 1900, sufficient to pay the estimated expense of executing the same, viz.:

....

....Dollars ($............).

....

Comptroller.

THE CITY, COUNTY AND STATE OF NEW YORK, ss.:

On this....................day of......................1905,

before me personally came..

....

....

to me personally known and known to me to be the same persons described in and who executed the foregoing obligations, and severally acknowledged that they executed the same for the purpose therein mentioned.

....

Notary Public or Commissioner of Deeds.

SPECIFICATIONS

For Furnishing the Metal Work for the Anchorages; and for Constructing the Towers, Cables, Suspenders and Suspended Superstructure of the Manhattan Bridge, over the East River, between the Boroughs of Manhattan and Brooklyn.

1. The following stipulations, specifications and description of materials and work, defined and described as the Specifications, are hereby declared a part and parcel of the Contract, made and executed on the...................... day of..........................190.., by and between the parties hereto for the same work or public improvement herein and above described, and which Specifications are referred to as such therein.

General description of work.

2. In general this Contract and the Specifications forming part thereof will cover the furnishing of the metal work for both Anchorages manufactured, delivered and ready for placing in the Anchorages and furnishing all material, plant and labor required for the construction, complete, of all steel or other metal work of the Towers, Cables, Suspenders, Suspended Superstructure and Ornamental Metal Work, as generally shown on the accompanying drawings.

Plans and drawings.

3. The accompanying drawings Nos. $\frac{33}{14}$, $\frac{33}{15}$ and $\frac{33}{25}$; $\frac{34}{4}$, $\frac{35}{1}$ to $\frac{35}{13}$, inclusive; $\frac{36}{1}$, $\frac{36}{2}$; and $\frac{37}{2}$ to $\frac{37}{14}$, inclusive, are an essential part of this contract and these specifications. The Contractor shall prepare accurate and complete working and shop drawings for all parts of the work, in accordance with the specifications and general drawings, furnished by the Department of Bridges, or as these may hereafter be modified under this contract, and shall submit these working and shop drawings to the Engineer for approval, and have them approved by him, before any work covered by these drawings shall be undertaken.

Working drawings.

Size of working drawings.

Working drawings to be submitted.

4. All working or shop drawings shall be of the standard size of the Department of Bridges, 27-inch by 40-inch, with a border ½-inch wide. The Contractor shall first submit prints of all working drawings in duplicate. When these have been checked and approved by the Engineer, prints shall be submitted in quadruplicate for final approval. One set will then be returned to the Contractor, one set will be sent to the Inspector and two sets will be retained by the Department of Bridges. Such additional prints of drawings as may be needed by the Department Engineers shall be furnished by the Contractor.

Shipping lists and invoices.

5. The Contractor shall also furnish to the Department of Bridges such shipping lists and invoices as the Engineer may require.

Final plans for record.

6. After the work has been completed the Contractor shall have all drawings checked and made to conform strictly with the work as executed, and shall furnish 2 complete sets of prints on cloth of all working drawings so corrected for the records of the Department.

Plans of plant to be submitted.

7. Before beginning work the Contractor shall submit to the Engineer, and secure his approval of, plans of plant and specifications as to methods of construction and handling material which he proposes to adopt in the execution of the contract. The Engineer's approval of construction plant and methods of conducting the work shall in no wise relieve the Contractor of responsibility for their strength, safety and efficiency.

Lines and levels.

8. All lines and levels necessary for the prosecution of the work will be established by the Engineer. The Contractor shall provide, at his own cost, all facilities necessary for establishing the lines and levels and shall take due precaution to preserve all marks and stations established by the Engineer. All marks destroyed by the Contractor's operations shall, when required by the Engineer, be restored at the Contractor's expense.

Adherence to plans.

9. All dimensions are to be taken from the drawings, and the Contractor will be held responsible for any deviation from these dimensions and from the

lines and levels established by the Engineer. The Contractor will, however, be required to verify their correctness, and, should he find any error, to bring the same promptly to the attention of the Engineer.

Intent of specifications.

10. Any question as to the intent or meaning of these specifications and the drawings shall be referred to the Engineer, whose decision shall be final and binding on all parties.

Points not covered by specifications.

11. Wherever any feature of the work is not fully set forth in these specifications, it must be understood that the same shall be governed by the rules of the best modern practice.

Inspection.

12. Ample facilities shall be furnished at all times to the Engineer and his assistants for inspecting the work. If any imperfect work or defective material is discovered at any time, the defects therein shall be remedied by the Contractor to the full satisfaction of the Engineer, and all defective material shall be promptly removed by the Contractor at his own expense. The Engineer shall have authority to reject any material or workmanship which, in his opinion, is unfit for the work or not in accordance with the specifications. This he may do at any time prior to the final acceptance of the work, even though the material or workmanship had not been condemned at the time it was furnished or performed; and the same shall be made good at the cost of the Contractor.

Rejection.

Character of employees.

13. The Contractor shall employ for all parts of the work only competent and reliable men. On receipt of notice from the Engineer that any employee is insolent, careless, unobservant of instructions, dishonest, or in any way a detriment to the satisfactory progress of the work, such employee shall be at once dismissed and not again allowed upon the work. This clause shall apply to subcontractors as well as to employees.

Injury to persons or property.

14. The Contractor shall be responsible for all injury to persons or property due to his operations, and shall build and maintain a safe and substantial fence, enclosing all the space occupied by his working operations that it is practicable to so enclose.

Patents.

15. Whenever or wherever an article of any class of materials is specified by the name of any particular patentee, manufacturer or dealer, or by reference to the catalogue of any such manufacturer or dealer, it shall be taken as intended to mean and specify the article or materials described, or any other equal thereto in quality, finish and durability, and equally as serviceable for the purpose for which it is (they are) intended. Nothing in these specifications shall be interpreted or taken to violate the provisions of section 1554 of The Greater New York Charter, which provides that, "except for repairs, no patented pavement shall be laid, and no patented article shall be advertised for, contracted for or purchased, except under such circumstances that there can be a fair and reasonable opportunity for competition, the conditions to secure which shall be prescribed by the Board of Estimate and Apportionment."

SPACE AVAILABLE FOR USE OF CONTRACTOR.

Space available.

16. There will be available for the purposes of this Contract such portions of the space indicated on the plans (Drawing $\frac{3}{2}\frac{3}{5}$) as will in the opinion of the Engineer be necessary for the prosecution of this Contract and not unduly interfere with the adjoining property, street traffic or the prosecution of such other work as the City has contracted for or may contract for, either on this bridge or through other departments.

Space for use during construction of towers.

17. The construction of the Towers must be commenced several months before the completion of Part I. of the Anchorages, which is that part of the Anchorages which must be completed before the construction of the Cables is begun. While the work on the Anchorages and Towers is proceeding at the same time, the Contractor shall have use of that space indicated on Drawing No. $\frac{3}{2}\frac{3}{5}$, between the shore side of the Tower Foundation and the Pier Head Line, together with such additional docking facilities within the jurisdiction of the Department of Bridges as the Engineer may decide to be necessary for the construction of the Towers, and which will not unduly interfere with the work on the Anchorages.

18. The Contractor must relinquish such space and docking facilities on both sides of the river, furnished by the Department of Bridges, as may be deemed necessary by the Engineer for landing and conveying materials for the construction of the Approaches, when this part of the work is begun. It is expected that the work of constructing the Approaches will begin about the same time as the work on the Cables. Provision for approaches.

19. Any additional space required by the Contractor must be provided at his own expense. Additional space

MATERIALS.

ROLLED CARBON STEEL.

20. All structural steel, excepting that to be used in the architectural work, ladders, gratings and such similar minor details as the Engineer may specifically exempt from the exclusive use of such steel, shall be made in an open hearth furnace lined with silica. Furnace used.

21. The stock from which this steel is made shall consist of pig iron, or of washed pig, or of a combination of both. Stock.

Acid open-hearth scrap resulting from previous heats for this work may be used in quantities not exceeding 25 per cent.

22. Washed pig shall not be decarbonized below 1.50 per cent. during washing, and an analysis for carbon, phosphorus and sulphur shall be made from each cast. During the reduction of steel in the open-hearth furnace decarbonization below 0.12 per cent. of carbon will not be allowed. Decarbonization.

23. No stock used in the open-hearth or the washing furnace shall contain more than .10 of one per cent. of phosphorus or more than .04 of one per cent. of sulphur. Phosphorus and sulphur in stock.

Iron ore.

24. The use of iron ore for the reduction of carbon in the furnace charge will be permitted according to usual and good practice.

Recarbonization.

25. The recarbonization of steel and addition of manganese shall be performed in a careful manner, giving the most uniform results and to the satisfaction of the Engineer.

Chemical requirements.

26. The ladle tests of steel as usually taken shall not contain more than the following proportions of the elements named:

Phosphorus	.04 of one per cent.
Sulphur	.04 of one per cent.
Manganese	.60 of one per cent.
Silicon	.10 of one per cent.

Rivet steel.

27. The ladle tests of the carbon rivet steel shall not contain more than .035 of one per cent. of phosphorus, and not more than .03 of one per cent. of sulphur.

Bolts and threaded rods.

28. Rivet steel shall be used for all bolts and threaded rods.

Ingots.

29. The amount of discard from the top and bottom of ingots must be sufficient in the judgment of the Inspector to insure steel of uniform quality, free from piping and undue segregation.

30. In order to determine the amount of discard necessary the manufacturer must furnish all the necessary facilities for experiments and investigations.

Billets.

31. All billets must be thoroughly inspected, and all snakes, cracks or other flaws must be chipped out, except where such flaws are so serious as to make it doubtful in the opinion of the Inspector whether they can be chipped out, in which case the billets shall be rejected.

Finished product.

32. The finished material shall be free from injurious seams, flaws, cracks or defective edges, and have a clean, smooth finish.

33. It shall be true to section (no defective fillets nor shaded back flanges). The variation in weight shall be in accordance with the standard specifications of the American Society for Testing Materials, and shall be less when plates are ordered to gauge for special service. (Par. 202.)

Physical requirements.

34. Specimens cut from the finished material shall show the following physical properties:

MATERIAL.	ULT. STRENGTH LBS. PER SQUARE INCH.	MIN. ELASTIC LIMIT LBS. PER SQUARE INCH.	MINIMUM ELONGATION PER CENT. IN 8 INCHES.	MINIMUM REDUCTION PER CENT. OF AREA.
(*a*) Shapes and universal mill plates..	60,000 to 68,000	33,000	$\frac{1,500,000}{\text{ultimate}}$	44 per cent.
(*b*) Eyebars, pins and rollers.........	64,000 to 72,000	35,000		40 "
(*c*) Sheared plates..................	60,000 to 68,000	33,000		44 "
(*d*) Rivet rods......................	50,000 to 58,000	30,000		50 "
(*e*) High carbon steel for trusses.....	85,000 to 95,000	45,000		35 "

Bending tests.

35. Specimens cut from plates, bars and shapes of items (a), (b) and (c), 2 inches wide shall bend cold 180 degrees around a rod of a diameter equal to the thickness of the specimen; when at or above a red heat 180 degrees flat.

36. Specimens cut from rivet rods (item (d)) shall bend 180 degrees flat when cold, or when at or above red heat. A test piece 2 inches long when heated to a bright cherry red shall flatten longitudinally under the hammer to a thickness of ¼ inch without serious cracking on the edges.

37. Specimens of high carbon steel item (e) not less than 2 inches wide shall bend cold 180 degrees around a rod of diameter equal to twice the thickness of the test piece without sign of cracking.

38. Full sized sections of eye-bar material shall bend cold about a rod of diameter equal to twice the thickness of the bar.

39. All specimens in bending tests must show no signs of cracking at any point.

Fractures in tension.

40. The fracture of all tension tests shall show a fine, silky texture, of a uniform bluish gray or dove color, free from black or brilliant specks, and show no sign of crystalization.

Red shortness.

41. Rigid tests will be made to guard against red shortness.

ROLLED NICKEL STEEL.

Furnace.

42. All nickel steel shall be made in an open-hearth furnace lined with silica. It shall be made in the same manner and of the same stock as specified for rolled carbon steel with the addition of nickel.

Chemical requirements.

43. The ladle test shall contain not less than 3.25 per cent. of pure nickel, and not more than the following proportions of the elements named:

Phosphorus	.04 of one per cent.
Sulphur	.04 of one per cent.
Manganese	.60 of one per cent.
Silicon	.10 of one per cent.

Nickel rivet steel.

44. Nickel rivet steel shall contain not less than 3.25 per cent. of nickel and not more than .035 of one per cent. of phosphorus, nor more than .03 of one per cent. of sulphur.

Heating and rolling.

45. Care shall be taken in the heating and rolling of nickel steel to prevent the formation of heavy scale. The material must not be pitted by rolling the scale into it. All material with pitted or heavily scaled surfaces, or with ragged edges will be rejected.

Physical requirements.

46. Nickel steel for plates and shapes in the finished material must meet the following physical requirements:

Ultimate strength, 85,000 to 95,000 pounds per square inch.
Elastic limit, 55,000 pounds per square inch minimum.
Elongation in 8 inches (per cent.), $\frac{1,600,000}{\text{ultimate}}$ minimum.
Reduction of area, 40 per cent. minimum.

Bending test.

47. Specimens of nickel steel not less than 2 inches wide shall bend 180 degrees around a rod of diameter equal to twice the thickness of the specimen, without sign of fracture.

Nickel rivet steel.

48. Nickel rivet steel shall have an ultimate strength of 70,000 to 80,000 pounds per square inch, an elastic limit of at least 45,000 pounds per square inch, and a percentage of elongation at least equal to $\frac{1,600,000}{\text{ultimate}}$ in 8 inches. It shall bend cold without sign of fracture 180 degrees flat; and a test piece 2 inches long when heated to bright cherry red shall flatten longitudinally under the hammer to a thickness of $\frac{1}{4}$ inch without serious cracking on the edges. Nickel steel shall comply with the specifications for carbon steel as to true section and freedom from flaws.

STEEL CASTINGS.

Furnace.

49. Steel for castings shall be made in an open-hearth furnace lined with silica.

Stock.

50. At least one-third of all stock used for steel castings shall be pig iron; and, when scrap is used, it shall be of a kind and quality satisfactory to the Engineer.

Decarbonization.

51. During the reduction of the steel in the furnace, it shall not be decarbonized below .10 of one per cent.

Use of iron ore, etc.

52. In making steel for castings, the use of iron ore, ferro-silicon, ferro-manganese and spiegeleisen will be allowed according to usual and good practice.

Chemical requirements.

53. The ladle test of steel for castings shall not contain more than the following proportions of the elements named:

Phosphorus	.05 of one per cent.
Sulphur	.05 of one per cent.
Manganese	.80 of one per cent.
Silicon	.35 of one per cent.

Annealing.

54. All steel castings shall be carefully and thoroughly annealed in a manner approved by the Engineer, and shall have a fine grained or silky fracture.

Soundness of castings.

55. All castings shall be sound and free from shrinkage cracks and as free from sand holes and injurious blow holes as the latest and best practice can produce. The Engineer shall be the final judge as to whether a defect is sufficient cause for rejection. Every casting which contains a blow hole or blow holes or any other cavity or flaw of such size and so placed as to injure it materially shall be rejected.

Physical tests.

56. Test pieces taken from coupons on the annealed castings shall show an ultimate strength of not less than 65,000 pounds per square inch, an elastic limit of at least 35,000 pounds per square inch, and an elongation of not less than 20 per cent. in 2 inches. They shall bend without cracking 120 degrees around a rod three times the thickness of the test piece.

Shape and finish.

57. All steel castings must be true to the drawings, with smooth surfaces, and all re-entrant angles must be neatly filleted. They must be planed exactly true and smooth where the drawings require, and all holes for bolts must be drilled accurately to metal templates. Bolt holes in castings shall be "spot-faced" wherever required by the Engineer.

Cleaning.

58. All cores of castings shall be thoroughly removed and the mold sand thoroughly cleaned from the surfaces.

MATERIAL FOR CABLES, SUSPENDERS AND HAND ROPES.

Steel for wire.

59. All steel for wire for the cables, suspenders and hand ropes shall be made in an open-hearth furnace, lined with silica.

60. The wire for serving the cables shall be made of Norway iron of a quality approved by the Engineer.

61. The stock used for wire steel shall consist of pig iron, with the admixture only of such quantity and quality of acid steel scrap as may be approved by the Engineer. No portion of the pig iron or of the scrap or iron ore used shall contain more than .06 of one per cent. of phosphorus, nor more than .04 of one per cent. of sulphur. **Stock.**

62. The use of iron ore for the reduction of carbon in the furnace charge will be allowed according to the usual and good practice. **Reduction of carbon.**

63. The recarbonization of steel is essential, and the addition of manganese and carbon shall be accomplished by the use of ferro-manganese or spiegeleisen only, and shall be performed carefully, in a manner most likely in the opinion of the Engineer to give good results. **Recarbonization.**

64. During the reduction of the steel in the open-hearth furnace, it shall not be decarbonized below .20 of one per cent. **Decarbonization.**

65. The ladle tests of the steel shall conform to the following chemical requirements: **Chemical requirements.**

Carbon, not to exceed............	.85 of one per cent.
Manganese, not to exceed.........	.55 of one per cent.
Silicon, not to exceed............	.20 of one per cent.
Phosphorus, not to exceed........	.04 of one per cent.
Sulphur, not to exceed...........	.04 of one per cent.
Copper, not to exceed...........	.02 of one per cent.

66. The finished steel shall be cast in ingots of such size, weight and shape and so poured as, in the judgment of the Engineer, to eliminate to the greatest degree piping and harmful segration. All surface defects shall be removed, and enough of the top of each ingot discarded to insure sound material. This discard must represent not less than 30 per cent. of the weight of the ingot, and shall extend as much farther as may be necessary to secure freedom from pipings and injurious segration. **Ingots.**

Billets.

67. The wire billets rolled from these ingots shall be free from cracks and seams, and shall be straight and have square sections, suitable for rolling into wire rods. The billets shall be cut into uniform lengths, to weigh not less than 350 pounds each, and surface defects shall be cut out.

Physical requirements.

68. The wire for cables, hand ropes and suspenders shall have an ultimate strength of not less than 215,000 pounds per square inch before galvanizing, and an elongation of not less than 2 per cent. in 12 inches of observed length, the stretch to be measured while the specimen is in the testing machine. The bright wire shall be capable of coiling cold around a rod $1\frac{1}{2}$ times its own diameter without sign of fracture. The cable wire before galvanizing shall measure 192/1000 of an inch in diameter as shown, and shall not vary in gauge more than 3/1000 of an inch. It shall be drawn on large-sized blocks, and finished in single lengths of not less than 3,000 feet, and shall be drawn as straight as possible without any kinks or sharp bends. The serving wire shall be No. 9 gauge before galvanizing. After galvanizing the steel wire shall have an ultimate strength of not less than 200,000 pounds per square inch of gross section.

Wire straightening.

69. No machine straightening of wire will be allowed. The wire must not, from tendency to coil, cause trouble or delay during any of the operations from the splicing and winding on reels to the completion of stringing into cable strands.

Wire splices.

70. The cable wires shall be spliced as shown on Drawing $\frac{36}{1}$. The splice shall have a strength of at least 95 per cent. of the ultimate strength of the wire, so made that it will resist the tendency to open or part during the operation of cable making.

Size of splices.

71. The splice consists of a sleeve not more than $\frac{3}{8}$ inch in diameter, with right and left-hand threads, the wires for shop splices having cold-rolled threads and mitered ends for locking the splice. All splices shall be carefully soldered in a manner prescribed by the Engineer.

72. While reeling the wires on large reels after galvanizing and splicing, the wires shall be run through a bath of cable shield so that they will be thoroughly coated therewith. **Cable shield.**

73. Sufficient physical tests on the finished coils of wire shall be made at the mills to satisfy the Engineer that the wire meets the specified requirements; but tests may be taken from both end of each coil, in order to insure the specified physical requirements. **Number of tests of wire.**

74. All field splicing of wire shall be done with thread cutting dies of approved pattern and in first-class condition, and shall be done by skilled workmen. **Field splices.**

75. The Suspenders shall be $1\frac{3}{4}$ inches in diameter and weigh not less than 5 1-10 pounds per lineal foot. They shall be composed of six strands of 19 wires each, laid around an independent wire rope center consisting of 49 wires, left hand lay. The Suspenders shall be, preferably, of long lay, but the lay must not be long enough to cause trouble in keeping the core in its true position during any of the operations before the suspenders are in their final position and loaded with the superstructure. **Suspender ropes.**

76. The wire for the cables, cable serving, hand ropes and suspenders shall be galvanized and inspected as to the following requirements for galvanized wire: When galvanized, it shall gauge not more than 5/1000 of an inch larger than the bright wire. The galvanized wire shall have an elongation of 4 per cent. in 12 inches of length, as observed under tension, and shall bend continuously around a mandrel four (4) times the diameter of the wire without breaking or peeling off any of the zinc coating. **Strength of wire for ropes.**

77. The galvanizing shall consist of a coating of zinc 99.75 per cent. pure containing not more than .03 of one per cent. of iron. It shall be applied in the molten state in an even and uniform manner. **Zinc for galvanizing.**

78. The zinc coating shall be so applied that it will adhere firmly to the surface of the wire and form a continuous coating of uniform thickness.

Test for galvanizing.

79. All specimens of galvanized wire shall be capable of withstanding the following test:

The sample shall be immersed in a standard solution of copper sulphate for one minute, immediately washed in water thoroughly and wiped dry. This process shall be repeated. If, after the fourth immersion there should be a copper-colored deposit on the sample or the zinc should have been removed, the sample shall be rejected.

Solution for test.

80. The standard solution of copper sulphate shall consist of a solution of commercial copper sulphate crystals in water. This solution shall have a specific gravity of 1.185 at seventy (70) degrees Fahrenheit. While a sample is being tested, the temperature of the standard solution shall at no time be less than sixty (60°) degrees Fahrenheit, nor more than sixty-five (65°) degrees Fahrenheit. While galvanizing the cable wire shall be coiled on blocks not less than four (4) feet in diameter.

Sockets.

81. The suspender ropes shall be cut to accurate length, with careful corrections for stretch under temperature and permanent load, and the two ends of each suspender shall be socketed with the cast steel screw threaded sockets shown on the plans.

Full-sized tests for suspenders.

82. Full size tests of suspenders and sockets shall be made to determine their strength and also the modulus of stretch of ropes for use in getting true length of suspenders.

Arrangement of suspenders.

83. There will be four suspenders at each panel point of each cable, or two loops over each main cable band. Each pair of suspenders will be drawn together at a point about four feet below the centre of the cable, as shown on the plans, and the utmost care shall be taken in adjusting them to insure a uniform distribution of load on the suspenders, in a manner prescribed by the Engineer.

Cable bands.

84. The main cable bands must have the grooves in which the $1\frac{3}{4}$-inch suspender ropes are to rest chipped and filed sufficiently to remove all irregularities and to leave them smooth and true, so as to afford satisfactory bearings for the suspenders.

85. The inner surfaces of all cable bands shall be accurately bored to true cylindrical form, with the ends counter bored as shown on the plans. Strips of steel of triangular section shall be provided at the joints made by the two halves of the cable bands for confining the cable wires. These strips of steel and the surfaces of bands against which they bear shall be accurately machined. The cable bands shall be machined along the abutting flanges, and wherever else required to make a satisfactory finish.

Boring and joints of cable bands.

86. Where the cables enter the saddles at the tops of the towers, the wires shall be left practically free from the saddles to the first cable bands, about 11 feet from the centre of the tower on either side of the saddles. In order to protect the cables from the weather at these points, suitable copper covers with flexible joints will extend from the ends of saddles to the bands before mentioned.

Protection of cables at saddles.

GENERAL PROVISIONS AS TO STEEL.

87. All steel for any purpose in this bridge shall be made in works of established reputation for the kind and character of steel specified.

Character of works.

88. All finished material shall be rolled or forged from billets which are of a size to reduce at least sixteen times in area in forming the finished shapes.

Size of billets.

89. No lime or other basic material other than iron ore shall be added to the furnace charge of acid open-hearth steel during any stage of the melting or pouring of the steel.

Treatment of furnace charge.

90. All superintendents, foremen, melters, helpers and others engaged in the manufacture of each class of steel for this work shall be men experienced in this line of work and of sufficient recent practice in making such class of steel to insure the best results.

Character of mill employees.

91. Acceptance of any material at the mill, foundry or elsewhere, before its use, will not be considered as final. Should any piece prove to be defective, at any time before the final acceptance of the completed work, it will be rejected and must be replaced by a satisfactory piece, without additional compensation to the Contractor.

Acceptance not final.

Identification.

92. When acid open-hearth steel is made in mills producing other kinds of steel, no material will be accepted unless made especially for this work; and when so made, it shall be subject to a system of identification approved by the Engineer; and, furthermore, such especially made steel shall be handled by itself or isolated in any manner required by the Engineer, to prevent the possibility of its becoming mixed with other kinds of steel. Any scrap used must be stamped with heat number or other marks for identification.

Presence of Inspector.

93. No steel or washed pig shall be made or cast, nor shall any material be rolled unless the Engineer or Inspector is present.

Orders to manufacturers direct.

94. All orders for steel shall be placed by the Contractor directly with the manufacturer, and all such orders shall have embodied in them the full specified requirements for the same, and as many carbon or hektograph copies of all orders for steel shall be furnished to the Engineer at the time of placing such orders with the manufacturer, as he may require.

INSPECTION AND TESTING.

Inspection.

95. All stock and materials used in the manufacture of the steel and the washed pig, and all operations at the furnaces or rolls or elsewhere about the establishments, or where such steel or washed pig is made or manufactured, shall be subjected to the examination, approval and acceptance of the Engineer or Inspector, who shall have free access to all records appertaining to the manufacture of the steel and the washed pig, from the beginning until its final acceptance. Ingots, etc., shall be so marked that the steel and heats can be identified at any time during the process of manufacture.

Chemical analysis, how made.

96. Chemical determinations of the percentages of carbon, phosphorus, sulphur and manganese (and nickel in the case of nickel steel) shall be made by the manufacturer, from one or more test ingots taken during the casting of each melt of steel, said test or tests to be fairly representative of each melt of steel. Two correct copies of such analysis shall be furnished to the Engineer or his Inspector.

Check analyses shall be made of the finished material on drillings from the tensile tests or bending tests of the rolled or forged material, and taken as directed by the Engineer or Inspector.

97. Specimens for determining the tensile strength, elastic limit, per cent. of elongation and per cent. of reduction, of plates, shapes and bars, shall be made of the rolled material, without annealing, unless the material itself is annealed.

Test pieces, plates, shapes and bars.

98. The Contractor shall furnish to the Engineer or Inspector copies of all records and furnish all facilities necessary to enable him to readily keep track of the steel and identify any heat at any stage during the process of manufacture. Two copies of all mill orders shall be furnished to the Inspector besides the copy sent to the Engineer.

Copies of records.

99. The Contractor shall have a chemical analysis of every melt made by a chemist satisfactory to the Engineer, and two copies of the analysis certified to by such chemist shall be delivered to the Inspector.

Chemical analysis.

100. In all tests for tensile strength the elastic limit shall be considered the least stress producing a visible permanent elongation in the gauged length of the specimen as shown by scribe marks of finely-pointed dividers, of a form approved by the Engineer.

Elastic limit of test pieces.

101. The Contractor shall at his own expense furnish all test pieces and perform such tests thereon under the supervision of the Inspector as may be required by the Engineer.

Test pieces.

102. There shall be at least one tensile test and two bending tests from each heat of steel and as many more in addition as the Inspector may call for to insure a thorough test of the quality of the material.

Number of tests.

103. If the material rolled from a melt varies in thickness by 3/8 inch or more for plates and shapes, or by 1/2 inch or more for bars, a test shall be made from the thickest, and also from the thinnest material rolled from the melt.

Separate tests shall be made for (1st) plates, (2d) shapes, and (3d) bars.

Check analysis.

104. Check analyses of the finished steel or wire billets may be made at any time when required by the Engineer. In case of material other than wire billets these check analyses shall not show a variation of more than 50 per cent. above specified limits for phosphorus or more than 100 per cent. above the specified limits for sulphur. Similar check analyses shall be taken from wire billets, and they shall not show an excess of more than 25 per cent. above the specified limit for phosphorus, nor more than 50 per cent. above the specified limit for sulphur. These check analyses are to be taken from the part suspected of being most highly segregated.

105. Additional tests shall be made if the melt is rolled at different places.

Number of tests from steel castings.

106. The number of coupons required on steel castings will depend upon the size and importance of the castings. They must be of such number as will insure uniformity as well as quality of the castings, and their number and location shall be determined by the Inspector. Coupons must not be detached from castings until after they are annealed.

Forms of test pieces.

107. Test pieces will generally be of the form recommended by the American Society for Testing Materials.

Test pieces.

108. The Contractor shall at his own expense furnish all test pieces of such shape and perform such tests thereon under the supervision of the Inspector as required by the Engineer.

Rivet rods.

109. Specimens of rivet rods shall be cut from the finished rods without further preparation.

Pins.

110. Test specimens shall be cut at a depth from the cylindrical surface equal to one-half the radius of the pin. All forged pins shall be annealed. Pins shall be tested individually (tensile test), but may be forged or rolled, as the case may be, in multiples, in which case two tensile tests shall be taken, one from each end of the bar. Each pin shall be so marked as to be easily identified.

Tensile tests may be the usual 8-inch specimens, or may be 2 inches (2″) between measuring points and ½-inch diameter, in which case the minimum elongation in 2 inches shall be $\frac{1{,}800{,}000}{\text{ultimate strength}}$.

111. From every lot of 35 eye bars, one bar shall be selected by the Inspector for full size test. All bars of each lot must have had as far as possible the same treatment and have been finished about the same time. Each lot must be kept separate and distinct until the full-sized tests representing them have been made and the bars accepted.

Full-sized eye-bar tests.

112. In event of the failure of any of the test bars to meet all requirements, two additional bars shall be selected from this group by the Inspector and tested. If either one of these additional bars fails to meet the requirements, the entire group of bars shall be rejected.

113. All full-sized eye bars shall be furnished and full-sized tests made at the expense of the Contractor.

Full-sized tests made at the expense of Contractor.

114. One bar out of each 18 bars rolled shall be made 18 inches longer than required for the finished bar, in order to furnish test pieces for annealing with the bars on which full-sized bending tests shall be made to check the annealing.

Bending and annealing tests.

115. The Contractor shall furnish for the use of the Inspector a suitably equipped office at the mills and at the shops.

Office room for Inspectors.

116. The Inspector shall be on hand to make all examinations and tests promptly. All facilities necessary must be furnished by the Contractor to the Inspector to make those examinations and tests thorough and conclusive.

Facilities for inspection.

117. The Inspector will stamp each accepted piece with a private mark, and no work shall be put on any material not bearing the Inspector's mark of approval. Any piece of material not so marked, or any piece which, through oversight or otherwise the Inspector has passed, although defective, or contrary to the specifications, may be rejected at any stage of the work.

Inspector's mark.

Stamping melt number.

118. Every finished piece of steel shall whenever practicable have the melt number of the manufacturer stamped upon it, independent of any slab number or other individual mark of the mill. Steel for pins and rollers shall be stamped on the end; rivet and lattice steel and other small parts may be bunched, with above marks on an attached metal tag.

Cost of check analyses.

119. Such analyses and check analyses as may be required by the Engineer shall be made by a chemist selected by the Engineer, and his remuneration and all expenses incident to such analyses shall be paid by the Contractor.

Cost of inspection.

120. The Inspectors in the mills, shops and field shall be designated by and subject to the orders of the Engineer and shall be paid by the Contractor on certificates of the Engineer. The total cost to the Contractor of the mill, shop and field inspection shall be in the aggregate $1.20 per net ton.

LOADS.

Live loads.

121. The bridge is proportioned to carry, in addition to its own weight and that of the floor, a live load either uniform or concentrated, or both as specified below, placed so as to give the greatest stress in each part of the structure.

122. For the cables, trusses and towers:

(A) A load of 8,000 pounds per lineal foot of bridge as "regular," or

(B) 16,000 pounds per lineal foot of bridge as "congested" traffic.

123. For the hangers, floor beams and floor system:

(C) On each elevated railroad track a load of 52 tons on 4 axles, 6 feet plus 10 feet plus 6 feet apart (the motor ends of 2 motor cars of the Interborough Rapid Transit Co.).

(D) On each street car track either a load of 26 tons on 2 axles 10 feet apart or a load of 1,800 pounds per linear foot of track.

(E) On any part of the roadway a load of 24 tons on 2 axles 10 feet apart and 5 feet gauge (assumed to occupy a width of 12 feet and a length of 30 feet), and upon the remaining portion of the floor a load of 100 pounds per square foot.

(F) On the footwalks a load of 100 pounds per square foot.

124. The wind pressure is assumed as a moving load acting in either direction horizontally with 2,000 pounds per lineal foot, but due allowance is made by taking the lateral deflection into account. **Wind pressure.**

PROPORTIONING OF PARTS.

125. All steel work shall be so proportioned that the maximum stresses shall not cause greater unit stresses than the following: **Unit stresses used.**

TABLE OF UNIT STRESSES.

	FOR DEAD LOAD, TEMPERATURE AND REGULAR LIVE LOAD, OR FOR DEAD LOAD, TEMPERATURE AND WIND.	FOR DEAD LOAD, TEMPERATURE AND CONGESTED LIVE LOAD, OR FOR DEAD LOAD, REGULAR LIVE LOAD, TEMPERATURE AND WIND.
	Pounds per Square Inch.	
(a) *For Wire—*		
Main cables	60,000	73,000
Suspenders	30,000	....
(b) *For Nickel Steel—*		
Tension in stiffening trusses	....	40,000
Compression in stiffening trusses	....	* $40,000-150\,\frac{}{r}$
Shear on rivets in stiffening trusses; field	....	20,000
Bearing on rivets in stiffening trusses; field	....	35,000
(c) *For Structural Steel in Towers—*		
Tension	20,000	† 25,000
Compression	* $22,000-90\,\frac{l}{r}$	* † $27,000-100\,\frac{l}{r}$
Shear on shop rivets and bolts	13,000	16,000
Bearing on shop rivets and bolts	25,000	30,000
(d) *For Structural Steel in Stiffening Trusses—*		
Tension	20,000	24,000
Compression	* $20,000-90\,\frac{l}{r}$	* $24,000-100\,\frac{l}{r}$
Shear on shop rivets	13,000	....
Bearing on shop rivets	25,000	....
(e) *For Structural Steel in Floor System of Roadway and Footways—*		
Tension chords	15,000	....
Shear on shop rivets, bolts and web-plate net section	10,000	....
Bearing on shop rivets and bolts	20,000	....

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* Where l = length and r = least radius of gyration both in inches.

† Including secondary stresses.

TABLE OF UNIT STRESSES—(*Continued*).

	FOR DEAD LOAD, TEMPERATURE AND REGULAR LIVE LOAD, OR FOR DEAD LOAD, TEMPERATURE AND WIND.	FOR DEAD LOAD, TEMPERATURE AND CONGESTED LIVE LOAD, OR FOR DEAD LOAD, REGULAR LIVE LOAD, TEMPERATURE AND WIND.
	Pounds per Square Inch.	
(f) *For Structural Steel in Floor System for Railroad and Trolley Tracks—*		
Tension chords	10,000	....
Shear on shop rivets, bolts and web plate net section	7,000	....
Bearing on shop rivets and bolts	14,000	....
(g) *For Structural Steel in Anchorages—*		
Tension in eye-bars	16,000	20,000
Bearing on diameter of pins	22,000	....
Bending or outer fibre of pins	22,000	....
Shear on pins	12,000	....
(h) *For High Carbon Steel—*		
Tension in stiffening trusses	....	35,000
Compression in stiffening trusses	....	*$35{,}000-135\,\frac{l}{r}$

* Where l = length and r = least radius of gyration both in inches.

In field driven carbon steel rivets, 15 per cent. shall be added to the number of rivets required by the foregoing permissible stresses.

CONSTRUCTION.

GENERAL.

Standards of measurement.

127. The rods and tapes, used by the Contractor in laying out the work in the shops, must be first carefully standardized with those used by the Department of Bridges in the location and construction of the masonry piers.

Temperature.

128. Provision shall be made for a free expansion and contraction of all parts corresponding to a variation in temperature of 110 degrees Fahrenheit.

Workmanship.

129. Workmanship and finish shall be equal to the best present bridge shop practice.

Straightening material.

130. All material shall be thoroughly straightened in the shops by methods that will not injure it before being laid off or marked in any way, and again straightened after punching and before assembling if required by the Inspector.

Sheared edges.

131. Shearing shall be neatly and accurately done, and all sheared edges of the main parts of the main members, gussets and splice plates of the main members, irrespective of thickness, sheared edges of all other material over ½ inch thick, and of such parts of secondary members as may in the opinion of the Engineer require it in order to furnish a neat, workmanlike finish, shall have at least ⅛ inch planed off in case of medium and nickel steel, and ¼ inch planed off in case of high carbon steel.

Abutting ends.

132. All abutting ends, edges and surfaces shall be milled or planed to fit, and in the case of compression members, the abutting surfaces must bear perfectly throughout.

Bending material.

133. All bent material which will be subject to considerable stress shall be bent when hot and after bending shall be carefully annealed.

PUNCHING, DRILLING, REAMING, ETC.

Thickness of plates to be punched.

134. All plates and angles to be riveted which do not exceed ¾ inch in thickness in case of medium carbon steel, or ⅝ inch in thickness in case of nickel steel shall, when not drilled out of the solid, be punched ⅛ inch smaller than the rivet to be used, and after being straightened shall be assembled and reamed to a diameter not more than 1-16 inch greater than that of the rivets to be used.

135. Punching must be so accurate that all parts of the hole shall be cut by the reamer.

136. Plates and angles thicker than ¾ inch in the case of medium carbon steel and ⅝ inch in the case of nickel steel, shall be drilled to full size out of the solid.

High carbon steel drilled.

137. High carbon steel of all thicknesses must be drilled out of the solid.

138. In sub-punching the die must be at least $\frac{1}{8}$ inch smaller than the rivet to be used, and the punch must not be more than 1-16 inch smaller than the die. Punches and dies.

139. In drilling and reaming, all parts must be so firmly bolted together that fins cannot form and chips cannot get between them. Bolting for drilling and reaming.

140. After drilling or reaming a special reamer shall be run over both ends of all rivet holes, removing all fins and sharp edges, and so shaping the holes that a fillet with a radius of about 1-16 inch shall be formed under both heads of all rivets. Filleting rivet holes.

141. Such of the main parts of the trusses and towers as may be required by the Engineer shall be assembled in the shop, and while assembled, the field connections shall be either drilled out of the solid or reamed to full size. When so assembled all parts must fit correctly. Shop assembling.

142. Such other parts of the work as the Engineer shall deem necessary to assemble in the shop to insure proper fit in the field shall be so assembled.

143. The holes for the end connections of floor beams and stringers, for the end connections of main lateral bracing, both in the suspended superstructure and the towers, and in all castings when not assembled in the shop for reaming, shall be reamed to metal templates, if required by the Engineer. Metal templates.

144. All metal templates shall be made of cast iron or of steel plates at least $\frac{5}{8}$ inch thick, with all holes lined with hardened bushings.

145. Twist drills shall be used in reaming all holes to metal template. Fluted reamers will not be allowed.

146. Wherever in riveted work the punching is not close enough to permit the reamer to properly clean up all parts of the holes, such holes must be reamed out for the next larger sized rivets. When holes cannot be cleaned up for the next larger sized rivets, the parts inaccurately punched shall be rejected. Use of large rivets.

147. Under no circumstances will heavy drifting be permitted. No heavy drifting.

Machine driving.

148. Whenever practicable, rivets shall be machine driven, both in the shop and in the field.

Riveting machines.

149. All riveting machines must be approved by the Engineer, and if required by him, adequate tests shall be made to satisfy him as to the efficiency and reliability of a machine.

Hand driving.

150. Wherever hand driving is absolutely necessary it shall be done entirely with 8-pound hammers, and suitable dollies must be used to hold the rivets up firmly against this driving.

Heads of rivets.

151. All rivets must thoroughly fill the holes, have full hemispherical heads concentric with their bodies, and grip the parts tightly.

Loose or badly formed rivets.

152. Any rivets that are loose or have cracked or improperly formed heads shall be drilled or cut out and replaced with tight rivets with properly-formed heads.

153. The Inspector shall in all cases determine whether rivets shall be cut or drilled out.

Heating.

154. Rivets, both in the shop and in the field, shall be heated in oil, gas or hard coal furnaces of a form approved by the Engineer. Hand forges can be used only in special cases by permission of the Engineer.

155. Rivets must be located uniformly throughout, or with the heads hotter than the points. Under no circumstances shall rivets be driven with points hotter than the heads.

156. Any rivetting gang refusing to observe this rule strictly shall be dismissed.

157. Rivets must not be burned. Rivets that " spit " on being taken from the furnace shall be thrown away.

158. In riveting all parts shall be securely bolted together so that there can be no separation. Before riveting all chips and fins shall be removed from surfaces in contact. **Bolting for riveting.**

159. Wherever bolts are used, in place of rivets for transmitting shear, the holes shall be carefully reamed after assembling so as to be normal to the end faces. The bolts must be turned to a driving fit, and the threads must not extend into the bearing. Washers not less than 1/4 inch thick shall be used under the nuts. Bolts must be thickly coated with red lead paint before insertion, so as to seal the hole against moisture. **Bolts in place of rivets.**

160. Wherever the grip exceeds 6 1/4 inches, turned bolts shall be used in place of rivets.

161. All heads and nuts must be hexagon shaped, and all threads must be U. S. standard. **Nuts.**

PINS AND ROLLERS.

162. Pins over 6-inch diameter shall be forged and must be sufficiently worked under the hammer to insure sound material **Pins over 6 inches diameter.**

163. All pin nuts, except where otherwise shown on the plans, shall be standard Lomas nuts, made of the highest grade of malleable iron or cast steel. **Pin nuts.**

164. Pins 6 inches in diameter or less shall be either rolled or forged. **Pins 6 inches and under.**

165. All pins shall be accurately turned to gauge, straight, smooth and entirely free from flaws. **Finish of pins.**

166. The segmental rollers under the anchorage saddles shall be of cast steel, sound and free from defects of any kind, and shall be finished in the same manner as specified for pins. **Rollers.**

EYE BARS.

Manufacture.

167. Eye bars shall be manufactured only in shops of established reputation and in a manner approved by the Engineer.

Physical requirements.

168. Eye bars must be so proportioned and manufactured that when tested to destruction they shall break in the body of the bar and show an ultimate strength of at least 56,000 pounds per square inch, and an elastic limit of at least 30,000 pounds per square inch. They shall show an elongation of not less than 15 per cent. in 10 feet of the body of the bar.

Heads.

169. Head of eye bars shall not be more than 1-16 inch thicker than the body of the bar. The net section of the heads of the bars though the centre of the pin holes (without taking into account any overrun in thickness), shall have an excess of not less than 30 per cent. over the body of the bar.

170. The heads shall be neatly and smoothly finished to the size and form given on the approved shop drawings, and symmetrical with respect to the axis of the bar.

Annealing.

171. Eye bars, forgings, steel castings or any other parts requiring annealing shall be carefully annealed with pure heat free from injurious gases before being machined.

172. The annealing of eye bars must be so done as to insure uniform heating throughout the entire length of the bar. The annealing temperature shall be not less than the temperature at which the steel becomes non-magnetic, and not greater than 75 degrees Fahrenheit over this temperature. It shall be held at this temperature only as long as is necessary to acquire a uniform heat and it shall be allowed to cool in the furnace to 570 degrees Fahrenheit for a time not exceeding 24 hours or less than 12 hours.

Slow heating.

173. The bars must all be slowly raised to the required temperature for upsetting, or annealing, and not thrust cold into a highly-heated furnace.

Bars straight.

174. The bars shall be perfectly straight before boring.

175. The pin holes shall be in the centre of the head and on the centre line of the bar. Pin holes shall be bored smooth and straight at right angles to the axis of the member and parallel to each other. **Pin holes.**

176. No variation will be allowed from the required lengths between centres of pin holes exceeding 1-64 inch. **Variation in length.**

177. Bars which are to be placed side by side in the structure shall be bored at the same temperature. Each panel of bars shall be piled on each other at the shop, and the pins for which they are bored shall be passed through the holes at both ends at the same time without driving. **Boring pin holes.**

178. Pin holes shall not be greater in diameter than the pins they are to receive by more than 1-50 of an inch. **Size of pin holes.**

CAST IRON.

179. All iron castings shall be of the best quality of gray iron, free from injurious blow holes or other defects, true to pattern and thickness with smooth surfaces and of workmanlike finish. **Quality.**

180. Sample pieces, one inch square, cast from the same heat of metal in sand molds, shall be capable of sustaining on a clear span of one foot a central load of 2,000 pounds. **Tests.**

181. Three test bars shall be furnished by the Contractor from each heat. If two of these fail to meet the above test, the castings from the heat will be rejected.

182. A blow of a hammer on a rectangular edge of a casting shall produce an indentation without flaking the casting.

BRONZE.

Quality.

183. All bronze required for bushings, bearings, etc., shall be the best grade of phosphor bronze, meeting such chemical and physical tests as may be required by the Engineer.

MATERIALS FOR PAINT.

184. The RED LEAD must be strictly pure, and shall contain at least 90 per cent. of true Red Lead (of the composition $Pb._3\ O_4$); the total amount of lead present shall not be less than 89 per cent., of which not more than 1-10 of one per cent. shall be present as metallic lead. The color shall be a clean and pure tint. The red lead shall be of the fineness that when washed with water through No. 19 silk bolting cloth not more than one per cent. shall be left on the screen.

Quality of materials.

185. The RAW LINSEED OIL must be absolutely pure, well settled oil; it shall be perfectly clear on receipt and shall not show a loss of over two per cent., nor a deposit of foots, after heating to 212 degrees Fahrenheit in a current of hydrogen. The specific gravity shall be between 0.932 and 0.937 at 60 degrees Fahrenheit.

186. The BOILED LINSEED OIL must be absolutely pure, containing no material volatile at 212 degrees Fahrenheit in a current of hydrogen; shall not contain any rosin or manganese, and shall be perfectly clear on receipt, and no deposit should form on standing provided the oil is kept at the temperature above 15 degrees Fahrenheit. The film left after flowing the oil over glass and allowing it to drain in a vertical position must dry to the touch after 24 hours.

Delivery.

187. The Red Lead shall be delivered in suitable 100 pound packages.

188. The Linseed Oil shall be delivered in strong, tight, well made white oak casks, hooped with iron, each having a capacity not exceeding 50 gallons.

189. All paint material to be delivered, inspected and sampled in the original packages.

Inspection.

190. Before acceptance the above specified materials shall be inspected; samples of each lot delivered will be taken at random, the samples well mixed together in a clean vessel, and the samples for test taken from this mixture; if it is found that this sample does not conform to the requirements of the specifications, the whole delivery it represents will be rejected, and shall be removed by the Contractor at his own expense.

Proportions of materials in paint.

191. Red Lead paint will be mixed in the proportion of 500 pounds of Red Lead to 18 gallons of Raw and Boiled Linseed Oil. The proportions of Raw and Boiled Oil shall be determined by the Engineer.

Mixing paint.

192. Paint must be mixed on the work in such quantities and in such manner as may be prescribed by the Engineer.

CEMENT, SAND AND GRAVEL.

Cement.

193. Cement shall be the best quality of imported or American Portland Cement, meeting all the requirements for cement in the "Specifications for the Construction of the Anchorage in the Borough of Manhattan of the Manhattan Bridge."

Gravel.

194. Gravel shall be silicious and clean. It shall vary in size from pebbles of $\frac{1}{4}$-inch maximum dimension to coarse sand.

Sand.

195. Sand shall be coarse, clean, sharp and silicious, equal in quality to the best Cow Bay sand.

MATERIAL FOR ANCHORAGES.

196. The material for the anchorage shall be of carbon steel and shall cover all the steel work, etc.. built in the anchorages and attached thereto (except reinforcing bars, cramps, dowels, etc.). The material for the anchorages is shown on Drawings $\frac{33}{14}$ and $\frac{33}{15}$. The quantities indicated thereon are for both anchorages.

Place of delivery. 197. The material for the anchorages is not to be erected under this Contract, but shall be delivered f. o. b. lighters by the Contractor at the foot of Pike Slip for the Manhattan anchorage and at the foot of Washington street for the Brooklyn anchorage.

Time of delivery. 198. The delivery of material for the anchorages shall begin on or before January 1st, 1906.

199. It shall be delivered in the order required for the prosecution to best advantage of the work on the anchorages. Deliveries of this material for both anchorages must be completed not later than February 1st, 1906.

TOWERS.

Kind of steel. 200. The towers will be built entirely of carbon steel, except in case of such minor details as are made of cast iron, wrought iron or bronze.

Base castings. 201. The base castings will be fastened together on their bottom beds by steel plates on inch thick which will be riveted on in the field. Top and bottom beds of base castings must be exactly parallel, and when the different sections are assembled they must form continuous planes.

Bottom bed plates. 202. The plates in the bottom beds of the base castings shall not vary in thickness by more than 1/100 of an inch. They must be planed on the edges and fit close to the planed bases of the castings throughout.

203. The base castings must be assembled in the shop and the rivet holes drilled first in the plates and then in the castings, using the plates as templates.

Sheet lead bearing. 204. There shall be placed on the masonry and immediately under the tower bases sheets of lead 1/16-inch thick.

205. The bases shall be connected with the masonry by anchor bolts $12\frac{1}{2}$ feet long and 3 inches in diameter, cemented in the masonry. The anchor bolts shall be threaded roughly for two feet from the lower end in order to give a good bond with the cement filling the holes. **Anchor bolts.**

206. Anchor bolt holes in the base castings must be drilled to template in order to make them fit the holes already drilled in the masonry.

207. After the base castings are finally set in place they shall be filled with cement concrete and cement mortar and grout to the level of the top beds of the bases and to the lines on the side indicated on the plans. **Castings filled with concrete.**

208. The exposed surfaces of the concrete shall be finished with cement mortar 2 inches thick and proportioned 1 of cement to 2 of sand.

209. The concrete shall be in proportion of 1 of cement to 5 of gravel.

210. Exposed surfaces shall be carefully molded to correct form and be made smooth and uniform.

211. Whenever concrete cannot be put in so as to insure filling the space, mortar or grout shall be used.

212. The bottom of the legs of the towers will be filled with concrete, mortar and grout to the lines indicated on the drawings and suitable drainage shall be provided for any water which may collect inside the tower. **Concreting bottom of tower legs.**

213. The main plates of the tower legs shall be planed or milled on all edges. The horizontal joints shall be milled with great care so as to form perfect contact throughout, and be perfectly normal to the axis of the tower. The vertical joints shall be planed before assembling so as to have a space of $\frac{1}{8}$-inch between adjacent plates. **Legs of towers.**

To insure perfect fitting.

214. All shop work and assembling shall be done in a manner approved by the Engineer, and so that a careful check can be constantly made on the accuracy of the work.

CABLES, SUSPENDERS AND FASTENINGS.

Number of wires.

215. There will be four steel cables approximately 20¾ inches in diameter. Each cable will consist of 37 strands and will contain 9,472 parallel wires of 192/1000 of an inch in diameter before galvanizing and not more than 197/1000 of an inch in diameter after galvanizing.

Method of building.

216. In the operation of cable making each strand will be built several feet higher than its final position when laid in the cable. This will be accomplished by placing the shoe at each end of the strand. a fixed and previously determined distance back of its final position and also by carrying the strand on sheaves above the grooves of the cable saddles on tops of the towers and at the anchorages. When the strand is finished it will be lowered into the saddle grooves, the shoes will be placed on the permanent pins at the ends of the anchor chains and the strand will then be adjusted to its proper versedsine by means of fillers between the shoes and the pins.

217. When all the wires of a strand have been laid in place and before the strand is placed in its final position in the cable, it will be bound together by bands to keep the wires in their proper position. These bands will be composed of five or six turns of No. 10 wire securely locked and will be placed at intervals not to exceed five (5) feet. For the ends of the strands within the anchorages these bands will be premanent and must be placed about two feet apart.

Rollers.

218. During the operation of cable stringing the running wires shall be protected from abrasion by suitable rollers where this is liable to occur.

Method of assembling strands into cables.

219. As the cables of this bridge will be much larger than any previously built, it will be necessary to assemble the strands in two or more groups; first the seven strands forming the centre of the cable shall be consolidated and rounded

into a core cable by removing the temporary wire bands and squeezing the wires of these core strands together by heavy pressure bands and then winding this core with several turns of No. 16 plow-steel wire at intervals of not more than 10 feet so as to secure the wires of the core cable together permanently in their true position. Second, a group of the twelve next outside strands shall be assembled uniformly around the core cable and rounded and compacted about this core by heavy pressure bands and then this enlarged core cable shall be wound with fine plow steel wire as before. Finally, the remaining eighteen strands will be assembled about the enlarged core in a similar manner and securely wrapped into the final cable with No. 8 gauge wrapping wire bands placed about four feet apart. The cable wires must be laid parallel and free from laps and must be so maintained throughout the work.

220. When each cable has been fully compacted and banded, the cast-steel suspended bands will be accurately placed and thoroughly clamped and the suspenders will be put in place. Before bolting on the cable bands, the cable under the bands shall be thoroughly cleaned of oil and receive a thorough coat of red lead paste. The temporary foot-bridges or working platforms used in constructing the cables may then be removed so that Contractor can proceed with the erection of the floor and stiffening truss spans, leaving the wrapping, painting and finishing of the cables to be done after the erection of the superstructure. Cable bands.

221. The final protecting covering of the cables will consist of a continuous serving between the cast-steel cable bands of galvanized round Norway iron wire applied under stress following immediately a thorough squeezing of the cables into compact cylindrical form by powerful clamps. The wire wrapping will extend under the ends of the cast-steel cable bands counterbored at each end to receive at least two complete turns of the wrapping wire which shall be secured to the bands in a suitable manner. The serving wire will be of No. 9 gauge before galvanizing. Protecting covering.

222. The ends of cable bands will then be made water tight by calking around the wrapping under the counterbore with lead and oakum or by pouring Calking cable bands.

this joint with molten lead, thoroughly calked, as may be required by the Engineer.

Painting cables.

223. After the wrapping is applied and the cables, suspenders, hand rail ropes and fastenings are completed they shall receive one coat of red lead paint.

Anchorages for foot-bridge cables.

224. The anchorages for the foot-bridges and their fastenings at the tops of the main towers have been arranged for the use of four supporting cables, each composed of four wire ropes.

Foot-bridge cables.

225. At the tops of the main towers tie beam saddles are shown on the detail plans, providing for making the land span and main span foot-bridge cables independent of each other; however, if contractor prefers, the foot-bridge cables may be made continuous from end to end, and supporting saddles with suitable clamping devices be used in place of the tie-beam saddles before mentioned.

226. The foot-bridge platforms except over the main towers may be made of timber, but all platforms and framing on tops of towers, and wherever at the anchorages it is practicable to avoid the use of timber, shall be made of metal.

Adjustment of cable stresses.

227. During the construction of the cables, if it is found necessary on account of exceeding the frictional resistance of strands in the saddles at the tops of the towers, or for any other reason, the balance of the horizontal components of stresses in main and land span cables shall be approximately maintained by bending the tops of the towers landward a sufficient amount for this purpose.

Temporary support of cables at anchorage.

228. The strands when laid in the cables shall be supported by temporary saddles at points where the strands diverge from the solid cable in front of the anchor chains to their respective strand shoes, so that they will remain in their final position and to facilitate the operation of adjusting the side span deflections.

Hand ropes.

229. Two 1¼-inch diameter galvanized steel hand rail ropes shall be stretched above each of the main cables from anchorage to anchorage and anchored to the main cable saddles at front of the anchorages. The hand rail

ropes will be attached to the main cable bands at panel points by $\frac{3}{8}$-inch diameter galvanized steel wire rope and will be set with a smaller deflection than the main cables to give a suitable initial stress in the strand fastenings and rigidity to the hand rails themselves. Wherever it is necessary to change the direction of the hand rail ropes it shall be done by supporting them on small columns or stanchions attached to the main cable bands.

Cable shield.

230. The cable shield for filling the interstices between the wires of the cables shall be some form of neutral mineral oil or other material of composition and consistency approved by the Engineer.

Application of cable shield.

231. The cable shield shall be applied in a manner prescribed by the Engineer to insure the most thorough and permanent filling of the interstices between the wires. As each individual strand is completed and temporarily seized, the wires shall be spread apart as much as practicable and thoroughly covered with cable shield.

232. Again as each group of strands is bound together permanently in the cable the wires shall be thoroughly slushed with the cable shield.

233. When all the strands of the cables are finally bound together the surface of the cable shall receive a final coat of cable shield.

Temporary protection for cable.

234. As fast as the strands are finally bound together in the completed cable the part of the cable so bound shall be thoroughly protected from the weather by a temporary covering, of material and form approved by the Engineer.

Seizing of completed cables.

235. The completed cable shall be temporarily seized between the cable bands at intervals of not less than 4 feet, the cables at each point before seizing being squeezed together as tightly as possible with powerful clamps.

Final serving. 236. The cables shall not be finally served until the suspended superstructure is completed and most of the dead load is applied. The serving shall be so done as to secure the highest degree of compression practicable in the cable wires and a thorough compacting of the serving wires.

237. Before the serving is applied all the cable shield shall be thoroughly cleaned from the surface of the cable (using benzine if necessary), and a thorough coat of red lead paste first applied in advance of the serving, in such a manner as to leave no spaces between the outer layer of cable wires or between these wires and the serving wires.

ORNAMENTAL WORK.

238. The ornamental work shall include the crown work at the tops of the towers, the upper balcony or gallery of both towers, the hoods and balconies at the roadway level, cable sleeves and other features which are not strictly structural.

Drawings. 239. The contract drawings show the general character and arrangement of the ornamental work. The Contractor will prepare full shop drawings for the work showing all arrangements of joints, thickness of material, details of construction, which shall be submitted to the Engineer and revised as he may direct. The work is to be executed strictly in accordance with the shop drawings which he finally approves.

Models. 240. Full size models for all carved or modeled ornamental work shall be supplied by the Contractor and submitted to the Engineer for his examination and will be revised as the Engineer may require, and shall not be used until approved by him.

Castings. 241. The drawings generally indicate the work which is to be cast and also the metal to be used, whether of bronze or of cast iron. All castings are to be clean and true to pattern, with sharp edges and smooth surfaces. Cast iron to be fine gray " No. 2 Foundry Iron."

242. The work which is not indicated on the drawings as cast iron or bronze will be built up of rolled, forged and bent shapes accurately formed and with all angles of full area and with sharp lines and true surfaces to make close joints on abutting members. Forged and bent work.

243. Rolled members must be of standard structural shapes, carefully straightened and shaped for this work. Rolled members.

244. The method of building up and jointing the ornamental work is to be fully shown on the shop drawings and must be so arranged as to make weather tight joints wherever possible. Joints are to be carefully and accurately worked and all junctions to be made even, to produce unbroken lines. Jointing.

245. The weathering of the joints to prevent leakage must be made absolutely perfect to the satisfaction of the Engineer.

246. The construction of the ornaments in details of stays, braces, connections to structural work, shall be as shown on the drawings and details shall be arranged to the satisfaction of the Engineer. Construction.

247. The riveting of all concealed work shall be executed according to the specification for structural work. Exposed riveting shall be done in such manner as to produce an accurate and symmetrical appearance. Rivets must be well driven, completely fill the holes and the heads must be formed up accurately without burrs and concentric with the holes. Rivets which do not head up accurately must be cut out and new rivets with accurate heads supplied. Wherever necessary to produce the design rolled or forged work shall be joined to cast work with round head bolts with nuts on the concealed side and with heads of the same shape as the rivets. Riveting.

248. Fastenings which are not to show are to be made with countersunk rivets except where junctions are made with casting and in such cases countersunk bolts will be used. Countersunk rivet heads are to be accurately chipped and filed flush with the surface.

Calking.

249. If necessary to produce weather-tight joints, tarred oakum shall be heavily calked into the joints and the outer edge of the joint calked with sheet lead solidly driven in.

Draining.

250. All pockets or gutters in the work are to be drained through weep holes and through lead pipe leaders where necessary. Leaders to be fastened to the underside of the drained surfaces with clamps and screws, with gasket joints.

Copper and lead covering.

251. Wherever necessary 20-ounce soft copper or 4-pound sheet lead may be used for covering joints. The arrangement and fastening of these covers must be satisfactory to the Engineer.

Hood roof.

252. The roof of the hoods immediately above the roadway level will be constructed of cast-iron plates of forms shown with rabbeted and water-checked joints, accurately fitted and bolted. These castings to be not less than ¼ inch in thickness and to be cast with gutters at the edges or with edges lipped for connection with the gutters to make weather-tight joints satisfactory to the Engineer. The joints will be made with red lead paste, a thin packing of oakum being used where necessary.

Gutters.

253. Gutters of hood roofs are to be drained through AA lead pipes flange-fastened to the under side of the gutters, pipes being concealed in the tower structure, carried below the roadway level and finally discharging outside of the tower structure through brass spouts securely fastened in position.

SUSPENDED SUPERSTRUCTURE.

Kinds of steel.

254. In the suspended superstructure, the main parts of the chords and of the diagonal web members of the trusses, the gusset plates connecting the diagonal web members to the chords and the chord splices shall be made of nickel steel, or of high carbon steel of the quality hereinbefore specified. All the rest of the material shall be made of medium carbon steel, except as otherwise indicated in the specifications or on the plans.

255. Connections of chord splices and diagonal web members of the stiffening trusses shall be made with nickel steel rivets as called for on the plans; or shall be made of equivalent strength with carbon steel rivets by increasing the size or number of the latter. Rivetted connections.

256. The basis of comparison of strength of nickel steel and carbon steel rivets shall be the allowable unit stresses of each given in the table, Par. 125, Page 68 of the Specifications, or shall be determined by the Engineer after experiments made by the Contractor under supervision of the Inspector for this purpose.

ERECTION.

257. All erection plans must be carefully and fully worked out and complete plans of same must be approved by the Engineer before erection is begun. Plans.

258. During the erection of the bridge all streets passing under the bridge and left open to traffic shall be covered so as to furnish protection against anything falling from above. Protection to streets under bridge.

259. The Contractor shall furnish at his own expense all necessary means for making the measurements for placing the different parts of the work both in the shops and field and checking its accuracy. Provision for checking work.

260. The suspended superstructure shall be erected in the order prescribed by the Engineer and in such a manner as will secure and maintain the proper adjustment of the structure. Suspended superstructure.

261. No gratings or other light work shall be placed in the structure until all the heavy work is completed. Light work.

262. All parts damaged during erection, as well as at any other time prior to the final acceptance of the work shall be made good to the satisfaction of the Engineer and at the cost of the Contractor. Damaged parts.

263. Appliances which shall prevent bending the latticing or other parts must be furnished for taking hold of the pieces in the field as well as in the shops. Appliances for handling material

Storing material.

264. All material, both in the field and at the shops, must be so stored as to prevent injury to it, and to prevent as far as possible any accumulation of water or dirt on it.

265. Stringers and floor beams must be stored on edge and not be laid on their sides.

Protection against fire.

266. During the entire erection of the work ample precaution shall be taken to protect it against injury by fire.

267. The amount of wood work about the bridge must be reduced to a minimum. No timbers shall be stored about the towers or anchorages, and no wooden buildings shall be constructed on the ground immediately adjacent to the anchorages, or the towers.

268. All temporary buildings on and near the bridge shall be as nearly fireproof as practicable.

269. The Contractor shall furnish at his own cost and as required by the Engineer, such fire protection in the shape of water connections, hose, hand grenades, fire-extinguishers, etc., as may be necessary and requirred by the Engineer.

PAINTING, ETC.

Before assembling

270. Before assembling all surfaces in contact shall receive a heavy coat of red lead paint.

Under castings.

271. Where surfaces in contact with other parts are not placed so that the spaces between can be filled with red lead paint, red lead paste or a suitable metal cement shall be used which will thoroughly and permanently fill any such spaces.

272. All rolled metal work shall be kept under cover as far as practicable from the time it is rolled until it is painted and no material which has been punched or planed shall thereafter be exposed to the weather until it has been painted. **Material not exposed to weather.**

273. Before painting at the shop all material shall be thoroughly cleaned of scale, rust, grease, dirt, chips and borings, and benzine shall be used wherever required by the Inspector for this purpose. **Cleaning.**

274. The material shall then receive a thorough coat of red lead paint darkened with lamp black. After the first coat has dried for not less than 24 hours, and before shipment a second coat of red lead paint of bright red color shall be applied. **Painting two shop coats.**

275. Any parts of structural work that rusts from any cause shall be cleaned and touched up with red lead paint when required by the Engineer. **Painting during storage or transmission.**

276. All paint must be thoroughly brushed on and spaces too small to admit a brush shall be thoroughly swabbed with sheepskin. Cracks and interstices where water is liable to enter shall be carefully filled or sealed with paint. **Careful application.**

277. Paint must be kept stirred to prevent settling, and where a coat runs and streaks an extra coat shall be applied. **Paint kept stirred.**

278. Pins, rollers and other pieces having planed or turned surfaces shall be thoroughly covered before shipment with a mixture of white lead and tallow. **Machine surfaces.**

279. All painting at the shop shall be done under cover whenever the weather is damp or threatening. No material shall be painted unless it is perfectly free from moisture. **Painting under cover.**

280. The heads of all field rivets shall be given a coat of red lead paint within three days after they are driven. **Heads of field rivets.**

Field coat.

281. After the completion of the structural work in the field, it shall be thoroughly cleaned, all rust spots touched up with red lead paint, and a final coat of red lead shall be applied. After the cable bands and suspenders have been placed they shall receive one coat of red lead paint, and after the cable serving has been completed, the cables, cable bands, suspenders, cable covers, etc., shall receive two coats of red lead paint after they have been thoroughly cleaned.

Protection of masonry.

282. During all the field operation in connection with this contract, the parts of all masonry liable to damage shall be protected by timber casing or other suitable means, as prescribed by the Engineer.

CLEARING UP.

283. No superfluous material can be stored on or about the bridge. After the completion of the work all erection plant and material belonging to the Contractor shall be promptly removed and the site of the bridge left in a neat and sightly condition.

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No. ....

THE CITY OF NEW YORK,

Department of Bridges

CONTRACT AND SPECIFICATIONS

For Furnishing the Metalwork for th Anchorages and Constructing the Towers Cables, Suspenders and Suspended Superstructure of the Manhattan Bridge ove the East River, Between the Boroughs o Manhattan and Brooklyn.

....

Contractor.

Dated .... , 1905

Assigned to ....

APPROVED AS TO FORM.

....

Acting Corporation Counsel.

Dated ....

EXAMINED AND FOUND CORRECT.

....

Contract Clerk.

Entered in the Comptroller's Office,

.... 1905

....

First Assistant Bookkeeper.